

# The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. XXXIV.

May 16, 1936

No. 881

## Chemical Trade Effluents

**D**R. A. PARKER, better known to most for his researches into the manufacture of coal gas, has given to the Society of Chemical Industry an impressive account of the work of the Water Pollution Research Board. To an audience of industrial chemists he contented himself with defending the need for the work of the Board by emphasising how often a careless factory that discharges an obnoxious effluent upstream may spoil the water for other factories nearer the sea and may thus be the source of needless expense to all its neighbours. There is hardly any branch of the chemical industry that is unaffected by the problem either from the point of view of disposing of effluents or from the opposite angle of finding an inexpensive unpolluted source of water for process work. From the purely publicity aspect, chemical works often gain an undeserved notoriety from the glee with which the popular press seizes upon the untoward death of fish or cattle as an excuse for pillorying the frequently innocent manufacturer of chemicals.

Although much rubbish is written upon the subject, there can be little doubt that the time is at hand when some central authority should take control of the water courses of the country. England, and parts of Scotland, Northern Ireland and Wales, are thickly populated districts in which any wanton disturbance of the amenities by the few is likely to cause annoyance or loss to the many. From that aspect it is important that the discharge of noxious trade effluents should be checked. On the other hand, this is a country that can only live by the successful prosecution of industry and nothing must be done that will increase manufacturing costs above a certain limiting value that will be different in different instances. The Water Pollution Research Board has, during its nine years of life, been partly engaged in selecting certain industries that habitually discharge fish-killing effluents and working out methods whereby the discharge of these effluents can be avoided. The beet sugar and the milk and milk products industries have been selected for first attack. The Board's work has been chemically successful; whether it has been economically successful in the sense that the processes devised have been cheap enough to be applied without raising manufacturing costs unduly does not appear from Dr. Parker's address. Government departments too often consider that costs are no concern of theirs. The Water Pollution Board can investigate, at considerable expense to the taxpayer, and can advise, but it has no power to get its advice put into practice; that is the weakness of the present position. If it had that power, there would be danger in the contrary direction that industry might be forced

to adopt possibly immature processes that would involve a cost out of all proportion to the good done.

The passing of the Rivers Pollution Prevention Act in 1876 was the first step towards making our rivers of reasonable purity. The Local Government Act of 1888 empowered the County Councils to take measures for carrying the Act into effect. By many, the Salmon and Fresh Water Fisheries Bill of 1923 is regarded as permitting, rather than preventing, the use of rivers as a dump for noxious effluents. There have been advocates for a central authority to control river pollution which shall be exempt from the disability which has hitherto prevented or obstructed the purification of rivers. It is understood that the Government proposes to introduce a Bill under the title of "The Public Health (Drainage of Trade Premises) Bill" which will provide that trades shall discharge their effluents into the public sewers. That is a solution of the problem that is advocated by the Water Pollution Research Board, but it has one defect, which is that many chemical factories (food factories being considered as chemical factories for this purpose) are situated far from the madding crowd where there is neither sewage works nor public sewer. Pollution of rivers in these districts may be even more disastrous than pollution near an estuary where works are thickly congregated and the water, being saline, is unsuited for most chemical uses. In such instances is it intended that factories must necessarily purify their own effluents?

If this objection could be overcome there is much to be said for compulsory purification by the public sewage works. The local authorities would in duty bound, be forced to undertake the most elaborate treatment of water. The dilution in populous districts might make such treatment possible, but it must be confessed that effluents can be visualised that will respond to no sewage purification treatment such as is now practised. Obviously, the local authority cannot under the Bill reject sewage with which it is called upon to deal. The only obvious solution will be for the chemical works, aided if necessary by the Water Pollution Research Board, to devise a process that will purify the sewage or trade effluent adequately at the works before discharge into the public sewer. Before any Bill such as has been suggested is introduced it should be carefully examined to meet difficult cases. The chemical industry should also watch the situation so that there may be no danger of chemical works being forced to incur abnormal expense because there is no local sewage works or because the effluent is not one that is amenable to treatment by the ordinary standard methods.

## Notes and Comments

### The Twenty-First Guthrie Lecturer

**P**ROFESSOR F. A. LINDEMANN, M.A., F.R.S., who delivered the twenty-first Guthrie Lecture of the Physical Society at the Imperial College of Science and Technology yesterday, has made important contributions to the advancement of science, and the subject of his lecture was "Physical Ultimates." The lecturer, who is Professor of Experimental Philosophy at Oxford University, has carried out theoretical and experimental researches in various branches of physics. Before the war he was distinguished for his work on the specific heat of solids at low temperatures; the Nernst Lindemann formula was a pioneer attempt to connect the specific heat of a substance with its characteristic frequencies. During the war he was attached to the Royal Air Force, and the apparatus which he evolved and the experiments he performed himself in actual flight on the causes and elimination of spin were recognised as of the highest importance. In 1919, at an early age, Professor Lindemann was appointed to the chair which he now occupies at Oxford. He has written papers on the origin and nature of magnetic storms, and his research work on meteors gave the first indication of the then unsuspected rise of temperature at heights of about 50 kilometres in the upper atmosphere, which has since been verified in other ways. His development of photoelectric cells and the electrometer which bears his name have been of incalculable service, not only to the solution of the astronomical problems which interested him and his father, who had his own observatory at Sidmouth, but to physicists in general. Recently he has turned his attention to the more philosophical aspects of physics, and in his book on the "Physical Significance of the Quantum Theory," he has attempted to clear up certain difficulties connected therewith.

### Synthetic Textiles

**E**FFORTS are being made by a number of organisations connected with the production of synthetic textiles to secure the official adoption of the word "rayon" to describe all artificial yarns, fabrics and materials. Last week in our leader on the romance of the rayon industry we referred to artificial silk and observed parenthetically that the name "rayon" did not seem to come readily. The present official description is artificial silk, the term used in the Finance Act of 1925. It is urged by a director of one of the largest synthetic textile producing firms in the country that confusion and probably loss to the trade will result from the efforts to substitute the name "rayon." Cheap Japanese artificial silk is being sold as rayon, and the use of the one name for both British and Japanese products may tend to break down the reputation of British products for superior quality and finish. The fear of the director in question is that once the public have learnt to think of all artificial silks as rayon they will insist on obtaining such fabrics at abnormally low prices. More serious still is the fact that the generic term "rayon" would embrace totally dissimilar products. There are two main groups in the industry, regenerated cellulose products and acetate artificial silks, made and dyed differently and with different

properties in use. If "artificial silk" is not an adequate description, why not adopt the straightforward and self-explanatory term "synthetic textiles"?

### The Quest for Oil

**A**CTIVITY is reported on all the home fronts in the quest for oil. The coal hydrogenation petrol plant at Billingham is, in the words of Sir Harry McGowan, working satisfactorily having regard to the magnitude of the enterprise and the unique nature of the process. The low temperature carbonisation industry, at one time chiefly concerned with smokeless solid fuel, but now fully alive to the importance of oil, is forging ahead with new plants in England and Scotland, and the gas industry is devoting more attention to benzol recovery, as evidenced by the opening of the extensive new plant at Edinburgh last week. Meanwhile the oil-drilling experiments which were inaugurated near Portsmouth a few weeks ago are being watched with interest by those who realise the vital importance of increasing our home supplies of oil. We learn that in addition to the deep test well at Portsdown, the Anglo-Iranian Oil Co. will shortly commence drilling near Henfield, on the Horsham-Shoreham road. This well, like that at Portsdown, will be a deep test. Shallow boreholes for the purpose of securing geological information have been drilled at Pevensey and Lewes, four at the former place and two at the latter. A geological borehole is also being drilled at Sydmonton, near Kingsclere, Hampshire, and another will shortly be started at Ham, in Wiltshire. Geophysical investigations with the torsion balance type of apparatus are being carried out for the company in Nottingham and Lincolnshire.

### Future of the Beet Sugar Industry

**I**F the British Sugar (Reorganisation) Bill now going through Parliament becomes law it is probable that the British Sugar Beet Society will turn its attention to assisting in the promotion, encouragement and conduct of research and education under the schemes which are to be prepared in accordance with the Bill. A suggestion along those lines has been made to the committee elected at last week's annual meeting. The beet sugar industry, which finds employment for a large number of chemists in this country, is anticipating a prosperous future under the administration of the British Sugar Corporation which is to be formed by an amalgamation of the existing manufacturing companies. A Sugar Commission is to be appointed by the Government to carry out impartial functions which will still be necessary, and the Minister of Agriculture has expressed the hope that the powers which Parliament is giving both to the corporation and the commission will not be under-estimated and that they will be used in an enlightened fashion. The 400,000 acres under beet cultivation not only give direct employment to about 40,000 men and indirect employment to many others, but retain in this country about £7,000,000 for the benefit of home producers. Considering the enormous sums which Great Britain paid for sugar during and after the war, the advantage of producing about a third of the nation's home requirements is self-evident.

## On Patenting Inventions

By JOHN JOHNSTON, M.A., LL.B.

**I**F a person is thinking about taking out a patent for an invention the first thing he should be sure about is to keep it secret. The invention must not be published at all, and must be in every way novel. If an inventor tells his invention to one or more people, not in express or implied confidence, this is considered publication and a valid patent cannot be obtained for it afterwards. A patent will be granted if the application is not successfully opposed, but it will not be a valid one. If he gets it taken from him by fraud he can get his opponent's patent refused or revoked, and can himself get a patent for the device.

The invention must not be in use at the date of the taking out of provisional protection, by anyone—either the person applying for a patent or any other person. Even secret use if to make money, will invalidate the patent. But secret use by way of reasonable trial and experiment will be allowed. In addition, the invention must not be too obvious. It must show ingenuity. If a person skilled in the subject and knowing what had been done before could, in the ordinary course of his work, and without having to exercise ingenuity, make the thing the patent will be invalid. The inventor ought to make a search in the Patent Office records as to novelty, or get someone to do so. It sometimes happens that a person invents a thing and patents it and, whether from want or capital or otherwise, does nothing more about it.

### Anticipation of Inventions

If the inventor in his search finds the invention anticipated he saves the protection fee and some useless work. If he finds no anticipation, or cannot conveniently make the search or get it made, he can take out provisional protection. If he has no fear of anyone inventing the same thing and forestalling him he can delay this step for a little while. By delaying it he will have the patent for a longer period, as it dates from the taking out of provisional protection. He will also have the foreign patents longer. Delaying to take out provisional protection gives him longer time to perfect the details, since a full description of the invention—enough to enable a man skilled in the subject to make and work the thing without having to exercise ingenuity—has to be put in his complete specification, which must be lodged twelve months from the taking out of the provisional or thirteen months on payment of an additional fee.

In the provisional specification the inventor must give a description of the invention—enough to identify it. Everything that is to be claimed in the complete specification must be foreshadowed in the provisional. But he should not do more than this, as to do more would limit him in drawing out his complete specification, since the two must conform. It often happens that a man invents some detail, and then finds a better way of doing things. No claims are necessary in the provisional specification.

### Risks of Delay

If the inventor finds that he has not time to settle all the details within twelve or thirteen months, he can take out another provisional specification provided he has not told his invention to anyone in the meantime, except in express or implied confidence, or published it in any way. He runs the risk, however, of someone else inventing the thing and applying for provisional protection before he has applied for provisional protection the second time. In such a case his patent, if granted, would not be valid.

In a complete specification the inventor must give a full description of the invention—enough to enable a man skilled in the subject to make and work the invention without having to exercise ingenuity. If he does not do this his patent will be invalid. He must clearly distinguish between what he has invented and what is already known. He must not claim

too much or make his claim too wide. But he should claim as much as he can. He must disclose the best way of doing things known to him at the time his complete specification was lodged—otherwise his patent will be invalid. Previous to the 1919 Patent Act an invalid claim invalidated the patent, but now each claim stands or falls by itself.

When the inventor has lodged two or more provisional specifications which are cognate or modifications one of the other he may get a single patent for the whole invention. He can take out a patent for a combination of two or more known devices if the combination shows ingenuity and is novel and useful.

### Chemical Processes

Substances merely discovered are not patentable. Substances produced are not patentable, with the exception of those mentioned in the next paragraph, but the methods of producing them are patentable if these are novel and useful. In the case of inventions relating to substances produced by chemical processes or intended for food or medicine the substances will be patentable provided that they are produced by the methods or processes of manufacture described and claimed or by their obvious chemical equivalents. In an action for the infringement of a patent, when the invention relates to the production of a new substance, any substance of the same chemical composition shall, in the absence of proof to the contrary, be deemed to have been produced by the patented process.

In the case of any patent for an invention intended to be used in the production of food or medicine the Comptroller of the Patent Office shall, unless he sees good reason to the contrary, grant to any person who applies for this a licence to use the invention for the production of food or medicine, and, in settling the terms of such licence and fixing the amount of royalty payable, the Comptroller shall have regard to the desirability of making the food or medicine available to the public at the lowest possible price consistent with giving to the inventor due reward for the research leading to the invention. The laws mentioned in this paragraph apply only to patents applied for after December 23, 1919. Patents applied for before that date are under the former law. The 1932 Act provides that when a substance is intended for food or medicine the mere admixture resulting only in the aggregation of the known properties of the ingredients of that substance is not patentable.

### Interpretation of Terms

The term "chemical process" has been construed on several occasions by the law officers and given a wide interpretation as covering processes which might be deemed to be of a physical nature, since they do not produce any chemical change in the nature of the substance, *e.g.*, sublimation and fractional distillation. It has also been held to cover activating carbon with oxygen.

The words "food" or "intended for food or medicine" have been construed by the law officers as covering any substance which is either itself a food, or which may be used in the preparation of food, or a substance which requires further processes to fit it for food. The word "medicine" has been held to include substances which may be applied externally. Ordinary cooking or mixing materials are not patentable, nor the mere addition of flavouring materials, but mixing in particular proportions may be, if such proportions have a special significance. Special advantages in the product are immaterial, and consequently not patentable, unless they arise from the process.

To obtain adequate protection for a mere substance it would seem necessary to claim separately all processes which appear to be practicable, and this, if the claims were clear

and definite, would probably be permitted. Each of the claims, however, opens a new avenue for attack on the grounds of non-utility and insufficiency. The best course would seem to be to claim in the main patent the best practicable method known to the patentee, and to take out one or more patents in addition for the alternative processes before the publication of the first specification.

The complete specification, including claims, is very important, so it will be advisable for the inventor, unless he knows patent law and practice, to go to a good patent agent to get this drawn up.

Any person—within two months of the advertisement of the complete specification, or three months on payment of an additional fee—may oppose the granting of the patent on various specified grounds, some of which are that the applicant obtained the invention from him, that it has been published in a magazine, specification or document, and that the specification does not clearly describe it and how it is to be worked.

The inventor can take out patents in those foreign countries which have joined the International Patent Convention, provided his application is made not later than one year after his application for provisional protection here. He gets priority from the date of this application. If he does not apply under the convention he does not get this priority.

Revocation of a patent may be obtained on various grounds, which are specified in Section 25 of the Patent Act of 1907, as amended up to July 12, 1932. When a patent has lapsed owing to the unintentional failure of the patentee to pay any fee within the prescribed time he may get it restored on payment of a fee, and subject to certain conditions specified in Section 26 of the Act just mentioned. The marking of an article with the word "patent" or "patented" or any words implying that a patent has been obtained for the article does not constitute notice of the existence of the patent unless these words are accompanied by its number. If any person sells an article with these words marked on it, he shall, if a patent has not been obtained, be guilty of an offence and be fined.

## Stabilising Powders by the Aid of Bitumen

### A New Subject for Investigation by Chemists

**A** MEETING of the Oil and Colour Chemists' Association was held in London on April 16, when Brigadier C. H. Haswell read a paper on "The Use of Bitumen for the Stabilising of Powders with Particular Reference to Soils."

The PRESIDENT (Mr. G. A. Campbell), in introducing Brigadier Haswell, said the work described in the paper was essentially topical from the point of view of the world position, and also in the scientific sense. Brigadier Haswell was a pioneer in the study of the stabilisation of soils, and not only had he had great experience abroad already, but was now actively engaged in similar work in connection with the extensions taking place in the Air Force in this country and with new aerodromes.

Brigadier HASWELL said that dust was a great carrier of disease, and if the areas around residential centres and hospitals could be stabilised at a reasonable cost, it would be a great advantage to humanity. His own interest, however, was in connection with aerodrome surfaces, experience having shown that dust destroys many hours of the life of an aeroplane but with stabilised soil, a dustless and waterproof surface could be laid with existing materials. Stabilised soil so increased the bearing strength of the natural soil that it could be substituted in many cases for the more expensive cement concrete in foundations. Due to its waterproof qualities, it could be used to replace the expensive puddle clay for the cores of earth dams and for the lining of water tanks. Indeed, the possibilities were endless and engineers would find these out as time went on.

Many engineers had been working to find methods of improving the stability of soil, and there were two general methods. The first consisted of incorporating with the soil other inert soil materials in such proportion that the resulting mixture would have the properties of a well-graded sub-grade. The second consisted of treating the soil with materials designed to prevent the soil from acquiring a detrimentally large void ratio in the presence of moisture. The first method, by grading, changed the physical characteristics of the soil. The second proposed to reduce the water capacity of the soil by the incorporation of chemical or physical admixtures, and it was this latter method with which he had been concerned.

The whole of the research work which had been done, continued Brigadier Haswell, was due to a casual experiment by an American engineer and a visit by himself to the laboratory of the Senior Highway Engineer of the Central Bureau of Public Roads, Washington. At that time he was touring the

United States to report on what had been done in the use of bitumen emulsions for road construction and in the course of his tour he visited the Glenn Martin Air Port, near Baltimore. The surface consisted of a loamy soil which in very dry weather became loose and dusty, and in wet weather a morass. The ground engineer conceived the idea of mixing with the soil a certain quantity of a stable mixing bitumen emulsion. He broke up the surface of the soil, sprayed it with the mixing emulsion and mixed it into the soil by means of disc harrows. After the last application of emulsion had been mixed in, a cloud-burst occurred and turned the field into a morass. The engineer considered the job spoiled, but when the water began to dry out the ground cracked. The engineer then put a roller on and consolidated the surface until it was hard and compact. That was done in 1930, and in 1933, when he himself saw it, the surface was as good as when it was first completed, although it had had no maintenance. The surface was hard and yet very slightly plastic. A small portion was dug up, and with the aid of a magnifying glass the minute particles of bitumen could be seen thoroughly dispersed through the soil.

During that tour he visited the Central Bureau for Public Roads and met Mr. Hogentogler, who had been studying soils and who put forward the following theory. To get an inert material into the pores of the soil it was necessary to satisfy completely the water capacity of the treated soil as indicated by its liquid limit, the liquid limit being defined as that moisture content expressed as a percentage of the oven dried soil at which the soil just began to flow when jarred ten times. The liquid limit varied for different kinds of soils from 14 per cent. to 45 per cent. For a soil with a liquid limit of 30 per cent. to disperse 5 per cent. of an extraneous admixture in the soil, it would have to be suspended in a carrier equal to 25 per cent. of the soil. Working on this theory Hogentogler found he could get perfect dispersion of bitumen through the soil by using a mixing emulsion and by diluting the emulsion so as to give the determined quantity of bitumen and the correct amount of water as defined by the liquid limit. This, said Brigadier Haswell, appeared to be the answer to the success of the Glenn Martin Air Port work.

Having found a successful experiment and a theory which seemed to provide the reason for it, American engineers started work in San Francisco, and he himself started work in Karachi. After some months' work, which included success and failure, both sets of engineers came to the same

conclusion, namely, that a solution had definitely been found to the problem of the stabilisation of soil or, what was more important, clay. It was found that a definite stabilising effect could be obtained with as low as 1.1 per cent. of bitumen and with each increment of bitumen there was an increase in the waterproof qualities imparted to the clay, up to an optimum quantity for each guide. The dispersion of the bitumen had the effect of destroying the capillarity of the clay, and there was undoubtedly a chemical affinity of some sort which altered the clay particles and rendered them waterproof. The percentage of water absorbed by stabilised clay varied with the amount of bitumen, but even though the clay was left soaking in water for an indefinite period, the amount of water absorbed remained constant. For an average clay with a 3 per cent. bitumen content, the water absorbed was about 9 per cent. In some cases the swell had been eliminated altogether and in the worst cases, such as black cotton soil, it was reduced to one-seventh.

### Problems for the Chemist

The reason for this was left to the chemists to find out, although Brigadier Haswell suggested that it is due to the colloidal particles of the clay being destroyed. Up to the present, engineers had been working on the principle of coating the particles, but with as low a percentage of bitumen as 3 per cent. this was not possible. What probably happened was that the colloidal particles had the greatest affinity for water and the water carried the bitumen direct to those particles, blotting them out completely. This blotting out prevented the clay from acquiring a detrimentally large void ratio and ensured stability. In the presence of water, therefore, the clay remained stable. When the water was dried out the stabilised material remained solid and hard, and when ground up the powder strongly resisted wetting and would float on the surface of a water bath. The bitumen content required to stabilise the soil depended only on the clay content. Thus, in a soil containing 70 per cent. sand and 6 per cent. bitumen content, the bitumen content of the whole mass would be three-tenths of 6 per cent., *i.e.*, 1.8 per cent. It was believed that empirical formulæ could be based on the percentages of colloidal clay, non-colloidal clay, silt and sand, which would enable the bitumen content to be predetermined for any soil.

Continuing, Brigadier Haswell said that many tests had been carried out in India, where the first scientific soil stabilisation work was done. It was found that the greatest bearing strength was obtained with 30 per cent. clay and 70 per cent. sand, but at Akyab in Burma, where the natural percentage of clay was 30 per cent., the greater compression strength was obtained by increasing the percentage of clay from 30 per cent. to 40 per cent. The basic principle, however, remained the same, but every case had to be treated on its merits, and a small amount of elementary laboratory work was essential to ensure the best results. At present it was not possible to lay down a hard and fast rule for the best and most economic proportions of sand and clay, but with future research work it was hoped to get nearer to empirical formula based on the colloidal particles of the soil. It was also mentioned that a machine had been evolved in which the compression strengths of different soils could be obtained. In this machine briquettes 1 in. thick and 3 to 4 in. diameter can be tested for depression under loads of 134 and 290 lb. per sq. in.

### Large Scale Experiments

The first experiment on a large scale was carried out at the R.A.F. aerodrome at Drigh Road, near Karachi, where the soil consisted of a sandy loam with a clay content of 30 per cent. The liquid limit of the soil worked out at 22.4 per cent. and from the laboratory experiments 5 per cent. bitumen gave the most satisfactory results. It was decided to stabilise a landing strip 1,000 ft. by 150 ft. to a depth of 4 in. The water required per 100 sq. ft. of area worked out at 74.6 gal. and to give a 5 per cent. bitumen content, 50 lb.

of bitumen were required per 100 sq. ft. or 9.1 gal. Having no machinery the whole work was done by manual labour. The landing strip was divided into 10 ft. squares, the correct amounts of water and emulsion were placed near each square, 4 in. were dug up and the whole thoroughly mixed to the consistency of mud. When a complete width had been mixed the coolies were marched backwards and forwards in line so as thoroughly to pug the material with their feet. The surface of the stabilised mud was then floated with a straight edge and allowed to dry out. In doing so cracks were formed and a stage was reached which was called the plastic limit, at which point the optimum consolidation could be obtained.

This plastic limit was defined as the lowest moisture content expressed as a percentage of the oven dried soil at which the soil could be rolled into threads  $\frac{1}{8}$  in. diameter in between pieces of glass without moisture showing on the glass and without the threads breaking into pieces. Consolidation was completed with a 6-ton tandem roller. The final surface was as smooth as a billiard table, with no signs of cracks. The work was completed in February, 1934, and was subjected to months of the heavy drought of Sind, and in the late summer the severe cloud-bursts of the monsoons. It stood up to the heavy work of the R.A.F. in such a remarkable manner that in 1935 it was considered justifiable to claim that the problem had been solved.

### Astonishing Chemical Action

After a short space of time what was thought to be an astonishing chemical action occurred in small patches. A fine dust formed on the surface, and when this was blown away more was formed, and so it went on. Investigation showed it to be due to saltpetre in the soil which in dry weather crystallised on the surface and formed a fine powder. This action was prevented by covering the surface with a bitumen sand carpet  $\frac{1}{2}$  in. thick and consolidated until the mass was waterproof and airtight.

Since the work at Karachi further experiments had been carried out in Delhi, Akyab (Burma) and Quetta, which had proved the value of the process. In the severe climate of Quetta where there were heavy snowfalls and a succession of thaws and heavy frosts, the surface tended to break up due to the absorption of a small quantity of moisture. This problem was also solved by sealing the surface with a  $\frac{1}{2}$  in. waterproof bitumen sand carpet. The result of this work at Quetta had been that the aerodrome was now usable throughout the whole year, whereas previously it was completely out of action during the monsoons. In conclusion, Brigadier Haswell mentioned that in California the sub-grades to roads have been constructed using the waste material of the road itself after stabilisation, and near San Francisco the buildings of a large exhibition have been built with mud bricks made of stabilised clay. He finished, as he began, by asking for the help of the chemist in obtaining answers to many things which the engineer at present could not understand in this connection.

### Points from the Discussion

Dr. H. CLAYTON said that from the purely physical chemist's point of view this subject bristled with possibilities for investigation in the laboratory. For instance, was the 4 in. depth adopted at Karachi the optimum, or was it merely a limit that had been set on the basis of the work done so far? It also seemed that the nature of the emulsifying agent used in preparing bitumen emulsion could play a very profound part in the penetration of the bitumen into the soil. He asked whether it was possible to have a bitumen emulsion with either a negative or positive charge on the globules. He took it for granted that the work so far done had been with negatively charged globules, but it would be interesting to see the results with positively charged globules. No mention had been made of the properties of the bitumen itself, but presumably it was possible to get different results according to whether hard or soft bitumen was used. Finally, was this

stabilisation effect confined to bitumen emulsions? Probably from the point of view of economics it was, but from the scientific aspect was it possible to use a latex emulsion and emulsions of resins, natural or synthetic?

Brigadier HASWELL said he had found the softer the soil the softer the bitumen required, and the harder the soil the harder the bitumen. The question of the positive and negative charged globules was a matter for the chemist.

Dr. CLAYTON said that on the face of it the phenomenon seemed to be one of waterproofing and therefore an emulsion of paraffin wax might be expected to behave similarly.

Brigadier HASWELL expressed a doubt as to whether paraffin wax would coagulate so that when the water dried out the soil remained stable. Answering a question as to whether it was possible to stabilise with crude oil, he replied in the negative, adding that his original attempts were made with a "cut back," which seemed to prevent any drying out. He had never tried an emulsive "cut back," although that was a possibility. It seemed to him, however, that it was necessary to have something of the bitumen type, or tar.

Asked about the possibility of using an emulsifying road oil, Brigadier Haswell said that in the United States it had been found that road oil only penetrated  $\frac{1}{2}$  in. and the surface had to be treated every year. In the States, where this oil costs 40 cents a barrel, this was not a serious matter, but it was uneconomical in other parts of the world.

Another speaker inquired if the author had had any experience of soils other than of the clay type. Brigadier Haswell replied that at Akyab the soil was practically pure sand with a good deal of saltpetre, and with  $\frac{1}{2}$  gal. of emulsion per c. ft. of sand a load of 8 tons per sq. in. was carried. One of the great advantages of pure sand was that

if a sand briquette broke up it could be recompressed under pressure and still have the same strength, so that with pure sand there was no difficulty with regard to stabilisation. Difficulties arose with clay soils. In Mesopotamia and the north of India the average clay content was 30 to 40 per cent., and in mixing with hot bitumen the great trouble was to get adequate dispersion.

Dr. CLAYTON suggested the real point of importance in the scientific consideration of this problem was the actual disposition of the bitumen in the stabilised soil.

Brigadier HASWELL said that was exactly the point which chemists must find out. He had merely given in his paper practical results and was now asking the chemists whether they could produce a good reason for these results.

Mr. W. E. WORNUM asked what happened to the bitumen? Were there clay aggregates with some form of bitumen filling of the voids in between? He added that a great many colloidal clays, like bentonite, if dried would float about on water and that raised the question as to the influence of the degree of dryness or otherwise of the soil before treated in the manner described in the paper.

Brigadier HASWELL said it was necessary thoroughly to wet the soil in the first place. In answer to a question as to the cost of mixing the soil in this country, he said it was being done at the moment in a concrete mixer, but during the summer he proposed to experiment with grader blades for turning the material over and spraying it, afterwards rolling it. If this were satisfactory the difficulty would be to get the plant in England. The War Office had offered him the use of certain plant of this kind which was in its possession, but if it was necessary to use concrete mixers the work would be much more expensive.

## Industrial Uses of Low Temperatures

### Oxygen—Rare Gases—Solid Carbon Dioxide

THE second lecture of the series arranged in connection with the Exhibition of Very Low Temperatures at the Science Museum, South Kensington, which was delivered in the lecture theatre of the museum on April 22 by Mr. C. G. Bainbridge, A.M.I.Mech.E., was the first of three dealing with the industrial uses of low temperatures.

Mr. Bainbridge described the development of the production, storage, transport and applications of oxygen, a branch of industry which has made immense strides in recent years, it being exactly 50 years since the first plant for the commercial production of oxygen was installed in this country. For the first 20 years the gas was produced chemically, but since that time it has all been extracted from the atmosphere by first liquefying the air and then separating it into its constituent gases. Some idea of the present importance of the industry, said Mr. Bainbridge, may be obtained from the fact that the approximate capacity of the factories in Great Britain is between 8 and 10 million cubic feet of oxygen per week.

The principal uses of oxygen are in conjunction with acetylene, coal gas or hydrogen for metal cutting and welding. Oxygen has also made possible high-altitude flying and the exploration of the stratosphere.

On April 29, Mr. J. T. Randall, M.Sc., dealt with the applications of the rare gases to industry, and showed that although the uses of helium, neon and argon are not confined entirely to lighting devices, such as the ordinary household electric lamp, the advertising neon sign and the new highly efficient street-lighting lamp, their uses were mainly in these fields.

Everyone is familiar with the modern filament lamp, but perhaps few people realise that each lamp is filled by highly mechanised means with nearly three-quarters of an atmosphere of argon, and that over one thousand million lamps of this kind are made every year throughout the world. The

red and blue neon signs of recent years are nowadays being supplemented with many new colours obtained by coating the tubes with powders which transform ultra-violet radiations into beautiful colours of pink, blue and green. Another type of lamp utilising rare gases is the new mercury street-lighting lamp now becoming familiar in most of the larger towns. These lamps, although their colour is something we are not yet quite accustomed to, have an efficiency roughly three times that of our household lamps, and consequently roads are being made much safer at night for pedestrian and motorist alike.

On May 6, Dr. I. J. Faulkner summarised historically the progress of the development which has taken place in the manufacture of solid carbon dioxide. In spite of the fact that it was known over one hundred years ago, it was not until the twentieth century that its commercial possibilities were seen, and it is only during the last decade that commercial exploitation has been carried out. The technical problems connected with storage and distribution over a wide area of such a wasting product were discussed, and it was indicated briefly how the industry has found practical solution in heavily insulated and specially designed containers.

As a refrigerant dry ice possesses many very desirable features, and it is now used extensively for the hardening and preservation of ice cream and for the transport of perishables such as meat, fish, poultry, fruit and flowers over journeys of several days' duration in hot weather. It also finds many applications in industry where its high rate of local cooling is particularly useful. It is useful not only as a refrigerant but, as a source of pure carbon dioxide gas, for when liquefied in suitable equipment it can be used to replace heavy and expensive cylinders which had hitherto been used for this purpose. In this way it is employed in the manufacture of beer and other beverages.

## Centrifugal Pump Installations

### Faulty Arrangements which Lead to Inefficient Work

**I**N many industrial processes there are small centrifugal pumps playing their part in the operation of the whole. Some, like condenser pumps, could be regarded as an integral part of a particular piece of equipment, but others, lifting, forcing or circulating water, are often put down in a more or less haphazard manner, and so long as they serve their purpose little attention is paid to their efficient operation.

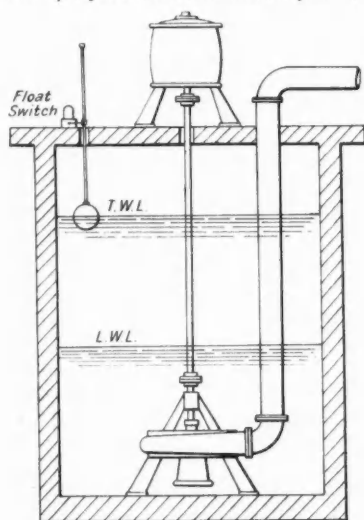


Fig. 1.

If it is badly installed it may be wasting a good deal of power.

#### Feed Well and Suction Pipe

It is hardly necessary to point out that not only has a centrifugal pump to be primed before it will draw water, but the motor should never be started until the pump is primed, and it is usually advisable to make some provision to prevent this, apart from the fact that better operating conditions can be obtained when there is no suction lift at all. While it has the drawback of being inaccessible for repairs until the sump is unwatered, the vertical spindle type of pump as shown in Fig. 1 is a good arrangement in some respects. The pump being always primed, it can be started and stopped without further attention, and if its purpose is to keep the water in the sump down to a predetermined level it can be automatically controlled by the simplest type of float switch. Owing, however, to the drawbacks attendant upon any appreciable length of vertical shaft, if this exceeds about ten feet, the better arrangement is that shown in Fig. 2. Here, the pump is suspended from the motor base plate by a heavy flanged tube in which are grease lubricated steady

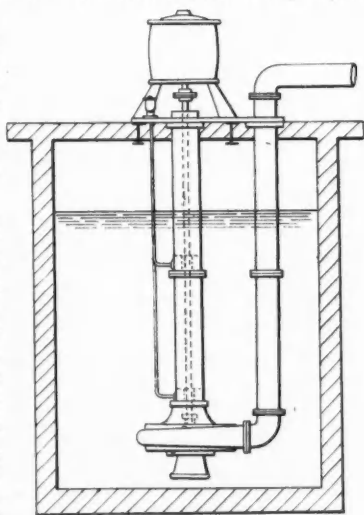


Fig. 2.

It is a very simple matter to fix an installation of this kind. Pump and motor are readily obtainable, and with the necessary piping and valves they can be easily erected and put into operation by the works maintenance staff, after which, so long as they perform their duty, little attention is paid to their efficient operation.

The average general purpose centrifugal pump, while simple enough as to be virtually fool-proof, is not in itself a very efficient machine, and

bearings for the shaft. The rising pipe on the left acts as a tie and the whole assembly can be lifted for inspection.

Where the water to be pumped is led to a feed well rather than to a sump, the use of the simpler direct coupled pump and motor suggests itself in Fig. 3. Here, all that it is

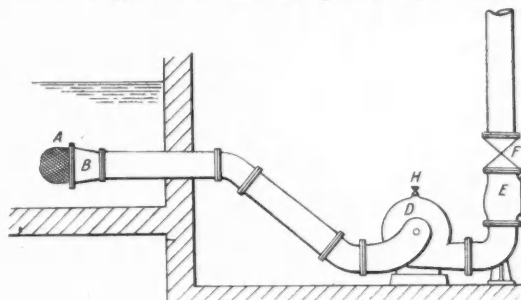


Fig. 3.

A.—Strainer. B.—Incraser. D.—Pump. E.—Reflux Valve. F.—Sluice Valve.

necessary to do before the pump is started is to open the air cock till water flows through it, and the lay-out, so far as the pump and piping is concerned, is still very simple, though that shown in Fig. 4 could generally be regarded as being preferable with its more accessible and easily cleaned strainer. Here it will be noted that the valve on the suction, obviously necessary to disconnect the pump in

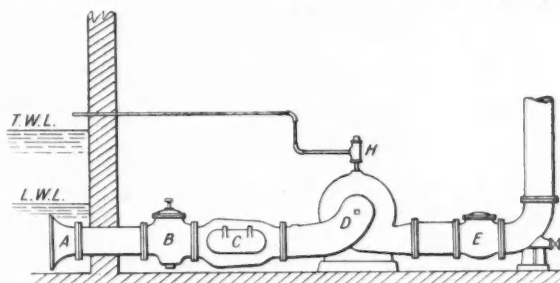


Fig. 4.

A.—Bell-mouth. B.—Plug Valve. C.—Strainer. D.—Pump. E.—Check Valve. F.—Priming Valve.

the case of repairs, is of the plug type, and it could be generally recommended for that particular purpose. Otherwise the lay-out does not call for much comment beyond pointing to the priming valve which is really nothing more than an air escape valve which normal conditions cause to remain closed.

#### Foot Valves and Suction Piping

Both the foregoing arrangements by eliminating the suction pipe are conducive to satisfactory conditions in the pump, but in practice having it located above suction level is usually much more convenient to arrange, and in Fig. 5 is shown a rearrangement of the installation in Fig. 4 to meet that condition, the first item of importance being the foot valve. It might at first be assumed if the pump was located above suction level and the suction pipe was provided with a foot valve that it could always be kept in the primed condition for immediate starting. Foot valves, however, cannot as a general rule be depended upon to remain drop tight so that there is some risk of the pump losing its water when standing. To install a vacuum pump to evacuate the pump chamber is an obvious solution of the difficulty, and where there are several pumps this may be deemed advisable but for a single unit other and simpler arrangements usually suffice. In this particular instance, function-

ing as a simple protective device is a by-pass around the discharge check valve, a check valve switch and a priming chamber. The priming chamber is connected to the top of the pump casing through a priming valve. When the pump is primed the switch on the top of the priming chamber is closed. The pump can only be operated in this condition because that switch is connected in series with the no-voltage release coil of the pump motor hand starter.

The set is started by operating the starting lever in the usual manner, but the lever will remain in the running position only if the no-voltage coil is energised. If the pump is not primed the no-voltage coil will not be energised and the starting lever will not remain in the running position. When the set is started the priming valve is automatically closed and the priming chamber drains into the suction pipe, the latter being then under vacuum. Before the chamber drains and the float switch in it opens the check valve switch will have closed and this will maintain the operating circuit through the no-voltage coil. Should the pump lose its prime the check valve flap will drop, its switch will open, the no-voltage coil will be de-energised and the set will

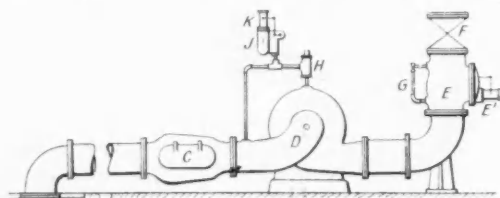


Fig. 5.

A.—Foot Valve. B.—Incraser. C.—Strainer.  
D.—Pump. E.—Check Valve. E'.—Check Valve  
Switch. F.—Sluice Valve. G.—By-pass. H.—  
Priming Valve. J.—Priming Chamber. K.—Priming  
Switch.

shut down. This subsidiary control through the check valve has something to recommend it for small sets and it is simply a matter of extending the hinge pin through a stuffing box to operate the switch, but the check valve itself is a much more important factor in efficient pump operation than is

generally realised and it is best, as a general rule, to leave it to function as that. The strainer itself is an important part of the equipment and where pumps are in continuous operation there is quite a lot to be said for one or two good designs of twin strainer which have been a long while on the market. Here with two strainers in a common chamber fitted with the necessary valves, one can be removed and cleaned while the other serves the pump. Too often the suction pipe is merely fitted with a rose which while cheap is difficult to get at if it chokes, as it often does. A much more satisfactory arrangement is that shown in Fig. 6. Easy of access and easy to be cleaned single handed by the operator in a few minutes it can be placed at any convenient point in the suction line. It is fitted with a stationary basket through which the water flows, chips and other foreign matter being held back and collected on the outside of the basket. Hinged handhole plates on each side of the body provide easy access. The shape of the housing ensures a smooth and even flow around the basket and through the slots to the outlet so that the friction loss is small.

In this connection it should always be remembered that friction due to bends or to too small a pipe or one badly fouled is to be specially avoided in the suction line in which

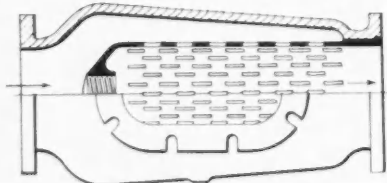


Fig. 6.

air leaks, too, often unsuspected, are another source of pump inefficiency. Attention is also directed to Fig. 7, which shows other conditions often met with in badly-laid suction piping. In the first place, apart from the vertical leg, of course, it should always be laid either truly horizontal or, for preference, with a slight uniform upward slope, otherwise there is risk of high spots where air will collect and cause the pump to lose its prime, and, in addition to its getting access to the pump through leaky joints, it may be entrained in the water or the water in the sump may be agitated at a point near the intake. For instance, when the water level in the sump is low and the inlet piece is not

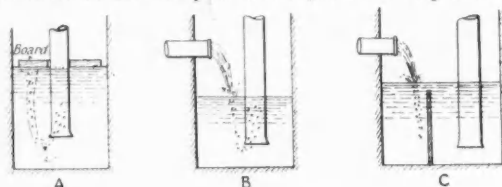


Fig. 7.

sufficiently submerged, air may enter the suction pipe through the formation of a whirlpool (Fig. 7, A). Here a board placed on the surface of the water as indicated will break up this whirlpool and so overcome the difficulty. Water falling into the sump near the intake pipe (Fig. 7, B) will churn air into the water and so cause trouble in the suction line. Where possible the supply pipe should be extended down into the sump and a partition placed between the feeder pipe and the pump inlet nozzle. Fig. 7, C, shows a partition or baffle which allows the air to rise and escape from the water without entering the suction. If it is found that the entering water swirls round the pump suction it should be baffled to prevent this also.

Reference to Fig. 5 will show that the necessary bend on the suction is well away from the pump. That is quite an important consideration and a bend should never be bolted directly to the pump. A sharp bend placed here results in noisy operation, loss of efficiency and, in the case of a single eye impeller, a good deal of end thrust, and more especially is this the case when there is a high suction lift. Such bends as are required should be of ample radius and placed as far away from the pump as possible. It is a mistake, too, to connect more than one pump to a suction pipe, but where this is either impracticable or would prove excessively costly the branches should always be in the form of Y-pieces. T-connections should be avoided, as they seriously interfere with the proper distribution of the water to the pumps by setting up disturbances in the suction line which in turn lead to inefficient working.

No centrifugal pump should ever be connected to a suction pipe serving a plunger pump, or deliver into a common rising main with one, as the pulsations even with a good design of three throw pump seriously interfere with the working of the centrifugal. The latter, too, where there is any appreciable suction lift, should always have water sealed stuffing boxes.

### Rising Mains and Reflux Valves

As can be ascertained from hydraulic tables there is a good deal of head absorbed when water flows at a high velocity through any appreciable length of pipe, and the provision of a taper piece and an oversize delivery main is a small extra cost well justified in the saving of friction head, which it effects, especially when the pipe becomes rather fouled, which under most conditions it will do. Even more important is to have a properly designed reflux valve. Although this part of the equipment may seem simple enough it has only recently been appreciated that the older hinged type left much to be desired. With its heavy parts and excessive hydraulic friction it not only wasted power, but, tending to slam, it induces shock setting up pulsations which may lead to a fracture in the rising main.

The modern conception of a reflux valve is seen in the tilting disc type of Glenfield and Kennedy, whilst others,

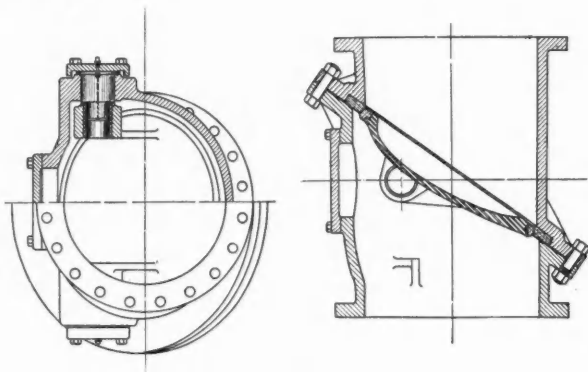


Fig. 8.

having the same general features—a free waterway without undue friction or tendency to slam—are sponsored by Blake-

boroughs and Alley and M'Lellan; it is the first named which is shown in Fig. 8. The body, usually of cast iron, is made in two sections, bolted together on the line of the seat and it will be seen to have a smooth flow line without pockets or recesses. The disc, which may be of cast iron, bronze or aluminium alloy, is of a dished aerofoil section providing strength with the minimum of resistance, while the hinge lugs on the side of the disc are fitted with hardened, corrosion-resisting alloy bushings. The body seat ring, which is renewable, is held in place between the two halves of the body while the disc ring is usually screwed to the disc.

With the older types of reflux valve the hydraulic losses are high because the door has to be lifted and maintained off its seat by the flowing water. The tilting disc valve, on the other hand, opens very easily by reason of its weight being borne by the pivots, and it is maintained in this position by a very small force. In addition, the closing of the valve is brought about by a combination of the unbalanced weight and action of the fluid stream on the longer arm of the flap, whilst the shorter one being forced against the stream cushions the closing motion and prevents that slamming usually associated with a reflux valve.

## Acetic Acid and Sulphur Bacteria

### A Review of their Biochemical Activities

**R**EPORTS recently published by the Department of Scientific and Industrial Research\* deal with the so-called acetic acid and sulphur bacteria respectively. These reports relate to the work of the Chemical Research Laboratory, Teddington, where researches are being undertaken which aim at utilising the beneficial bacteria and overcoming the effects of harmful bacteria. Bacteria, however, may be either useful or harmful according to whether their presence is desired or not. Acetic acid bacteria, for example, in a vinegar factory are of the highest utility, but in the manufacture of wine they are so many disease germs.

The acetic acid bacteria, which take their name from the important part they play in the manufacture of vinegar, were at first thought to be one species, but in course of time it was recognised that many species existed, and the report deals with the different chemical products they yield and makes suggestions for future research. Natural processes are often much more direct than the processes of the laboratory, and the report refers to many products produced directly from such starting materials as sugars, glycerol, etc. Some of the products obtained are suggested for use in the manufacture of synthetic resins, and in view of the world's capacity for producing sugar the day is not perhaps far distant when this material will be produced not only to feed human beings, but also to feed bacteria to obtain those chemical products that these lowly organisms are capable of producing from it.

Many varieties of sulphur bacteria, *i.e.*, bacteria which draw their energy from sulphur compounds, play a very important part in Nature. Some degrade the proteins which compose the organs and tissues of living things to hydrogen sulphide, the gas, smelling like rotten eggs, and therefore so dear to the schoolboy chemist. Others oxidise this hydrogen sulphide to sulphur and sulphates, which in turn are assimilated by plants and animals to form the complicated sulphur-containing proteins, so completing the cycle. Other species form hydrogen sulphide direct from sulphur, and others directly oxidise this gas.

In agriculture, besides producing assimilable sulphur compounds essential for the growth of plants, oxidising sulphur bacteria convert insoluble phosphates into a more available form. They make it possible to cultivate excessively alkaline soil and rapidly convert to sulphates the hydrogen sulphide formed in soils which is poisonous to many plants. The action of these bacteria, however, is not always beneficial. It has been suggested by some, although denied by others, that sulphuric acid produced by them in certain cases has been responsible for decay of concrete and stonework. Through their action on the sulphur in the material used for sealing the joints they have been stated to have been responsible for the destruction of a pipe line. In putting them to useful work the report suggests that they may provide a cheap and convenient means for removing undesirable sulphur compounds in such materials as shale oil or certain clays.

The sulphur bacteria which produce hydrogen sulphide are believed to be responsible for the blackening of mud and sand in the waters of certain estuaries. It also appears that they probably participate in the marine deposition of chalk, in the formation of soda in the soda lakes of Western Siberia, and in the production of the large deposits of zinc and lead sulphide in the United States. Cases of disintegration of concrete walls and tiles in sewage works and drains, and several cases of metallic corrosion, have been attributed to them. They have also caused contamination of gas by hydrogen sulphide in gasholders, and their presence in the filter beds of waterworks has caused trouble owing to the water acquiring an unpleasant taste.

The present report suggests that the presence of sulphur in petroleum, which is a factor of great economic importance, may be due to the action of these bacteria on the water and brines in oil wells. It is stated that the "possibility of these organisms taking at least a part in the natural processes of oil formation cannot be entirely ignored."

\* *Survey of the Biochemical Activities of the Acetic Acid Bacteria.* By K. R. Butlin. (1s. net.) *Review of the Physiology and Biochemistry of the Sulphur Bacteria.* By H. J. Bunker. (9d. net.) Published by H.M. Stationery Office as Chemistry Research Special Reports Nos. 2 and 3.

BRITISH exports of chemicals, drugs, dyes and colours for April, 1936, were valued at £1,630,143, a decrease of £90,000, as compared with April, 1935. Imports were valued at £1,082,937, an increase of £147,834; re-exports were £38,630, an increase of £10,249.

## Letter to the Editor

### The Future of Spectroscopy in the Laboratory

SIR,—I have read with more than passing interest the articles by Dr. Judd Lewis and Mr. Gair under the above heading in *THE CHEMICAL AGE* of April 25, and whilst I agree with Mr. Gair's statement regarding the position "some thirty years ago," I consider that he has not done justice to the recent efforts to remedy the defect to which he refers.

In this connection I would say that both London and Liverpool have been to the fore in providing practical instruction in spectrum analysis. Courses in theoretical spectroscopy associated with practical instruction in modern application of this science to industrial and similar problems were held for some years at University College, London. Practical instruction is available at Liverpool, and since 1926 a course on spectroscopic analysis has been provided at the Sir John Cass Technical Institute, London. This was started as a theoretical course only, but two years ago it was developed into a complete course of instruction in theoretical and practical spectroscopic analysis which extends over 13 or 14 weeks and is held during the first three months in each year. It may interest your readers to know that this session 21 students attended the lectures, and 18 the practical course at which modern Hilger instruments were used. The course to which I refer is part of a wider evening course on modern methods of analysis, which also includes electro-chemical analysis, X-ray analysis and spectroscopic analysis. Whilst these courses are held in the departments of chemistry they are not confined to chemists as the students in the department of metallurgy are strongly recommended to attend, especially those parts dealing with X-ray analysis and spectroscopic analysis.

My personal experience as the principal of this Institute leads me to say that there is a definite demand for courses of this character and that at least one education authority has for a decade recognised the importance of providing systematic training in spectrum analysis.—Yours faithfully,

GEO. PITCHIN,  
Principal.

The Sir John Cass Technical Institute,  
Jewry Street, E.C.3.

## Society of Public Analysts

### Election of New Members

AN ordinary meeting of the Society of Public Analysts was held on May 6 at the Chemical Society's rooms, Burlington House, the president, Dr. G. Roche Lynch, being in the chair. Certificates were read in favour of: John Glover, Arthur St. George Huggett, Frank E. A. Leibbrandt, John H. Seager and Alfred P. Telford. The following were elected members of the Society: Willem J. P. Pelle, George H. Walker, Herbert W. Watson and Harold F. P. Webber.

### Peroxide Impurities in Ether

The effects of some impurities in anaesthetic ether were discussed by Mr. J. H. Coste and Dr. D. C. Garratt. Experiments with ethers so contaminated that they could not possibly be used for anaesthetic purposes have shown that the proportion of peroxide volatilised, and breathed by the patient, is so small that, for ethers contaminated only to the extent likely to occur in general practice, the actual amount of peroxide volatilised would be negligible. Hence, peroxides themselves are not the cause of the after-effects which may be produced by impure ether.

In a paper on the determination of bromides in presence of other halides, Dr. F. W. Edwards, F.I.C., Dr. H. R. Nanji, and Mr. E. B. Parkes, described a method and apparatus whereby a mixture of chloride and bromide is treated with potassium permanganate and dilute phosphoric acid, the

liberated bromine aspirated through a cold solution of potassium bromide, and the equivalent amount of iodine titrated with thiosulphate solution. In the presence of iodides the method is modified in such a way that the iodides are completely and selectively oxidised to iodate by means of an excess of permanganate in phosphoric acid solution prior to the aspiration.

A micro-Zeisel apparatus for determining methoxyl and ethoxyl groups was described by Dr. J. J. Chinoy, M.Sc. The method is rendered simpler and more efficient by the use of a spoon-like device for introducing the material into the distillation flask.

## Institute of Chemistry

### Liverpool and North-Western Section

METHODS of determining the presence of alcohol were described in a paper read by Mr. A. T. Parsons, chemist in charge of H.M. Customs laboratory in Liverpool, at the annual meeting of the Liverpool and North-Western Section of the Institute of Chemistry, at Liverpool on April 16.

Mr. Parsons said that alcohol had long been a source of revenue, and the early attempts at its determination were made for fiscal purposes. The first instrument to be used for the purpose was Clarke's hydrometer, which was first employed at early as 1787. This was replaced by Sykes's hydrometer, which was adopted in 1816, and this instrument, supplemented by lighter hydrometers (shown by the speaker), was still in use at the present day in the Customs and Excise Department, while Sykes's system of determining proof spirit was still the basis on which duty was charged. The speaker then described technical methods of determining spirit, and told of the methods of determining the presence of alcohol in the blood.

Mr. B. D. W. Luff, the chairman, and several other members suggested that there was a need for clarifying the subject by using a percentage rather than a "proof" spirit basis, which confused even people who were chemists.

### Officers for 1936-37 Session

The following officers were elected for the 1936-37 session: Chairman, Mr. L. V. Cocks; vice-chairman, Mr. B. D. W. Luff (retiring chairman); hon. treasurer, Professor W. H. Roberts; hon. secretary, Mr. G. W. Beaumont; hon. assistant secretary, Mr. J. F. Hardwick. The following members were elected to the new committee: Messrs. R. B. Croad, E. Gabriel Jones, G. H. Turner and A. W. M. Wintle.

## New Poison Rules

### Exemptions from the Act

THE Home Secretary has made the Poisons (Colouring) Rules, 1936, and the Poisons (Amendment) Rules, 1936, provisional under Section 23 of the Pharmacy and Poisons Act, 1933. The Poisons (Colouring) Rules, 1936, require the addition of a dye to certain arsenical substances sold for use in agriculture and horticulture such as sheep dips, fruit sprays, vermin and weed killers, and replaces the colouring provisions of the Arsenic Act, 1851, which lapsed on May 1, 1936. The Poisons (Amendment) Rules, 1936, add to the articles in the third schedule to the Poisons Rules, 1935, which are exempted from the provisions of the Act. The poisons affected are ammonia, dinitrophenol and potassium hydroxide (caustic potash). Appendix I of the recently issued Home Office Memorandum on the provisions of the Pharmacy and Poisons Act affecting shops other than chemists' shops (Poisons No. 1, Shopkeepers) includes these exemptions.

Copies of the new Rules (1d. each) and the Home Office Memorandum (3d. net) may be purchased from H.M. Stationery Office.

## WORKS EQUIPMENT NEWS

## Rotary Air Compressors

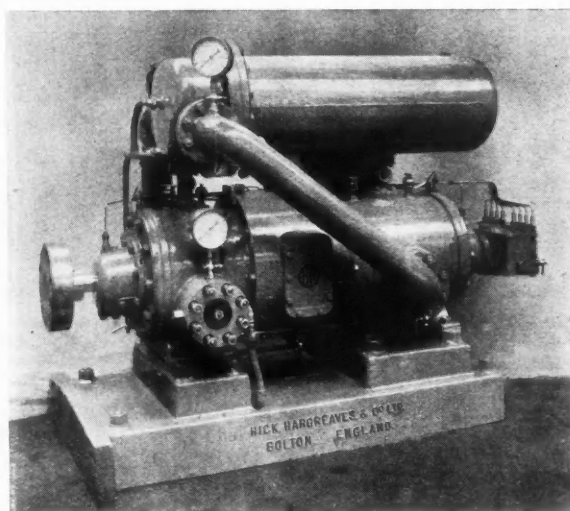
## A Notable High Speed Design

**T**HE latest scientific principles in the design and construction of air compressors are well illustrated by the rotary air (or gas) compressors, available also for use as vacuum pumps, made by Hick Hargreaves and Co., Ltd. These have a number of notable features, including a series of fully floating restraining rings, roller bearings, and enclosed casing, and are available also as portable units or for permanent installation.

The design is of the positive, multi-chamber, rotary type, consisting of a cast-iron rotor carried on a spindle, running eccentrically at very high speed in an outer steel cylinder or casing. Also the rotor has a number of loose thin steel blades, carried in a series of deep radial slots, these blades being thrown outwards by the centrifugal force so that they always make airtight connection with the inside of the outer cylinder irrespective of their position in relation to the space formed at one portion between the cylinder and the rotor, due to the eccentric mounting of the latter. The tip of the blades, however, do not come into actual contact with the cylinder, but with the floating restraining rings, which are of very slightly less internal bore than the cylinder, these rings also revolving at a high speed, practically the same as the rotor, so as to reduce the friction to a minimum.

The cylinder is provided with air suction and discharge ports situated in such a position that the air (or gas) is compressed, gradually and uniformly, as it is carried through by the blades projecting radially from the rotor always at the correct length as already indicated, to ensure efficient contact with the restraining rings. The standard sizes are within the range of 8-2700 c. ft. of free air per minute, and in twin machines double the capacity, while the air pressures 1-150 lb. per sq. in. as desired, or 99.5 per cent. vacuum if worked as a vacuum pump.

Some of the advantages claimed are compactness and very small space, easy direct coupling to an electric motor, small steam turbine or other desired drive, continuous flow of air



Enclosed type two-stage air compressor.  
(Hick Hargreaves & Co., Ltd.)

because of the multi-chambers, no valves, small pipe diameter, minimum wear and tear, especially because of the elimination of crossheads, cranks and connecting rods, and easy adaptation to automatic and "distance" electric control.

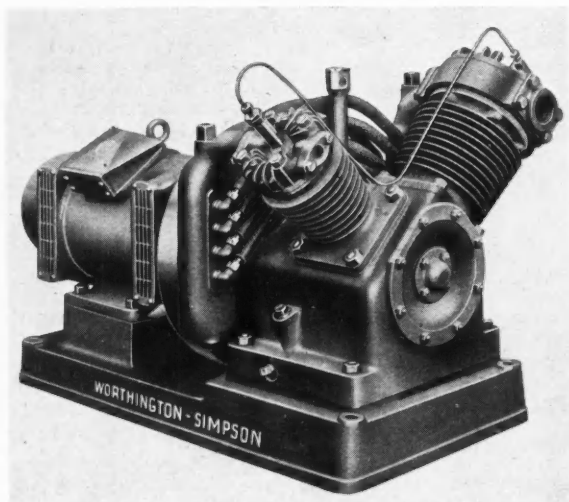
## Compressors with Waterless Cooling

## Two-Stage Machines of New Design

It has long been recognised that, when compressing air to pressures higher than about 60 lb. per sq. in., great advantages accrue from performing the work in two stages, with

intercooling between the first and second stage. The most important advantage is, of course, the saving of power, which, at 100 lb. discharge pressure, may be as high as 15 per cent. The two-stage compressor also has a higher volumetric efficiency, resulting, at 100 lb. pressure, in an actual delivery of free air as much as 23 per cent. higher than that of a single-stage machine of the same displacement. Added to these advantages are the benefits of cooler and drier air, largely eliminating condensation in the pipe lines, and of lower operating temperatures, resulting in less carbonisation, better lubrication and reduced cost of maintenance.

In view of these well-known advantages it is not surprising that two-stage compression has been universally adopted for many decades in the case of compressors of any considerable capacity. On the other hand, it has generally been considered that for capacities below about 400 cubic feet per minute, the advantages of two-stage compression were offset by the greater initial cost involved. In other words, the technical advantages had to be conceded on economic grounds. Great interest, therefore, attaches to a range of compressors introduced during the past year by Worthington-Simpson, Ltd., since these machines render it commercially practicable to realise all the advantages of the two-stage cycle in compressors ranging from 400 down to 20 c. ft. per minute capacity. A two-cylinder machine of "V" design, typical of sizes up to about 80 c. ft. per minute, is illustrated; three-cylinder machines having a vertical high pressure cylinder and two inclined low pressure cylinders arranged radially about a common crank, are also made.



Angle type air-cooled two-stage air compressor  
(Worthington-Simpson Ltd.)

Besides the adoption of two-stage compression in all sizes, a most notable feature of these compressors is that the cooling of both cylinders and intercooler is effected entirely by air, no water being required. The close finning of the cylinders and heads is immediately apparent from the illustrations, which also clearly show the radiator type waterless intercooler adopted for the three-cylinder machines. The intercooler in the case of the two-cylinder type comprises a number of gilled tubes connecting two cast iron headers. A forced draught is created by a fan—incorporated in the flywheel in the case of the smaller machines—which serves both the intercooler and the cylinders.

This cooling system is remarkably effective, the discharge temperature at 150 lb. per sq. in. pressure being actually about 200°F. lower than that prevailing in a single-stage water-cooled compressor. Moreover, its efficiency remains unimpaired throughout the life of the compressor, since there is no silting up or scaling of the cooling surfaces, such as is liable to occur in a water-cooled machine. The elimination of cooling water will undoubtedly be widely welcomed, as it renders the compressor largely self-contained, and avoids the

danger of damage by frost or by failure of the water supply, besides effecting an appreciable reduction in initial and running costs. The radial cylinder arrangement, both in the two-cylinder and three-cylinder types, results in an extremely compact machine, and at the same time the valves and other parts are eminently accessible. Perhaps the most interesting feature of this cylinder arrangement, however, is the excellent running balance achieved. As a result, these compressors run without perceptible vibration at any speed, and only the lightest foundation is necessary.

It may be remarked at first sight that the multi-cylinder design involves a certain degree of complication, owing to the larger number of parts required. On closer examination, however, it will be found that the number of major wearing parts is not in fact greater than in more familiar designs, while the use of ball and roller bearings largely eliminates the need for adjustments. The lightness of individual parts is also a great convenience, and we understand that, even in the case of a 400 c. ft. machine, the entire compressor can be dismantled from floor level without the aid of lifting tackle.

## Leakage of Refrigerant Gases

### A Useful Detector

DURING recent years there has been a continued growth in the use of non-combustible halide gases as refrigerants. The

fact that these gases are relatively odourless, tasteless and colourless renders it necessary to have a quick and sure method of locating leaks while cooling units are being installed and later during servicing. Such a device, known as the Prest-O-Lite halide leak detector, has been developed by the Linde Air Products Co., of New York.

It should be pointed out that certain halide derivative gases used as refrigerants, such as ethyl chloride and methyl chloride, are combustible. Insurance companies and safety rules prohibit testing for leaks of a combustible gas with any flame. Therefore, under no circumstances, should any flame leak detector be employed for locating leaks of any combustible gas. Before using any device, the nature and property of the halide gas used should be ascertained if not definitely known. The halide leak detector consists of a regular Prest-O-Lite needle valve torch handle assembly, a burner which includes a suction nipple for attaching a rubber hose, and a chimney with a copper reaction plate. The rapid flow of acetylene through the burner causes a suction which draws in any refrigerant gas near the open end of the suction tube.

To operate the detector, the flame is first adjusted so that the top of the outside cone is level with or slightly above the chimney of the detector. The open end of the suction tube is used to explore around those places where a leak might occur. Any halide refrigerant gas drawn into the burner is decomposed with the formation of free acids. These acids, coming into contact with the hot copper reaction plate, cause instant colour response in the flame. Visible colour indication of the smallest concentration of refrigerant gas by a green-tinted flame is given by the Prest-O-Lite halide leak detector. When a large amount is present, the flame assumes an intense violet colour. After the source of the leak has been passed, the flame clears almost instantly.

The two-colour variation of flame gives visible indication of the amount of refrigerant gas present. If there is a considerable amount of refrigerant gas in the surrounding atmosphere the leak can be located by the variation in the intensity of the colour of the flame.



The Prest-O-Lite halide leak detector affords a simple method of locating halide gas leaks, even in difficultly accessible places.

## Waste Heat Recovery

### Importance of the Economiser

FOR efficient operation of many industrial establishments in the chemical engineering, iron and steel, and general metallurgical industries, as well as in gas works and coke oven plant, it is essential to utilise for steam generation the large amount of waste heat available from furnace settings, using not only boilers but also economisers. In this con-

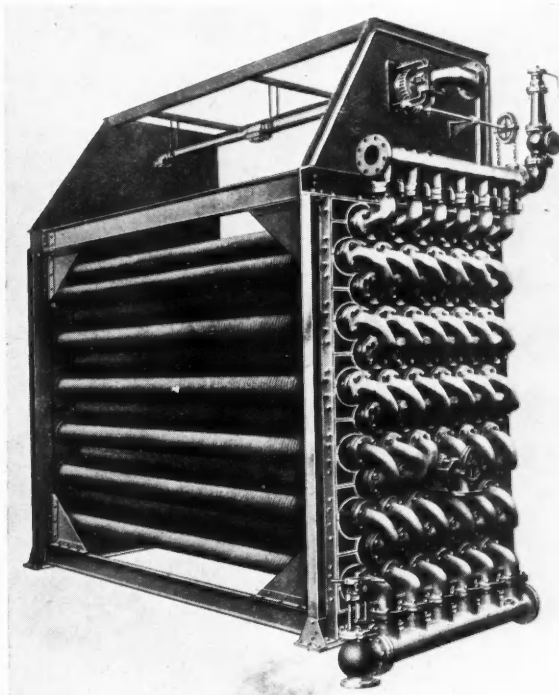
nection, of considerable interest is the recently issued Special Report No. 10 entitled "Waste Heat Boilers in Open Hearth Practice," being the second report of the Open Hearth Committee of the Iron and Steel Industrial Research Council (London), which confirms, as the result of detailed tests carried out at the works of the Park Gate Iron and Steel

Co., Ltd., Chesterfield, the substantial economies that are to be obtained by using waste heat for steam generation.

With regard to fuel economisers, E. Green and Son, Ltd., the original inventors (in 1845) of the economiser, have four standard type available for raising the temperature of boiler feed water. The industrial design for pressures up to 250 lb. per sq. in. consists of nests of vertical cast iron tubes  $4\frac{3}{4}$  in. external diameter and generally 9 ft. but sometimes 11 ft. 6 in. high, fixed close together, and provided with mechanical scraper gear operating on the outside of the tubes to prevent non-conductive deposits of soot and fine ash. All the tubes are operated in parallel, the feed water entering at the bottom, passing upwards, and discharging from the top, at a temperature up to say 300-325°F.

For very high steam pressures the horizontal steel tube "steaming" economiser has been developed, cleaned intermittently by blowers instead of continuously operated mechanical scrapers. In this connection the above firm manufacture the "Foster" horizontal gilled tube economiser, which consists of 2 in. steel tubes having outside gills of cast iron shrunk on so that no external corrosion of the steel is possible. These gilled steel tube economisers will stand up to 2,000 lb. per sq. in., or over if necessary, while they are light in weight and have a superior rate of heat transmission because of the gills; in addition, the cast iron gills prevent external corrosion, whilst de-aeration of the feed water helps to eliminate internal corrosion. In addition, there is the "Green" vertical cast iron tube high pressure economiser, with scrapers as usual, having special "ring-stay" joints suitable for a working pressure up to 500 lb. per sq. in., and the horizontal cast iron gilled tube economiser, cleaned with steam blowers, also suitable for pressures up to 500 lb.

Generally, for average conditions of industrial waste heat recovery conditions the vertical cast iron economiser is the best, with or without the "ring stay" joints, depending upon the pressure, and a large number of installations are at work. Cast iron, for example, has the great advantage of being impervious to corrosion, irrespective of de-aeration of the feed



Horizontal gill cast iron tube economiser.  
(E. Green and Son, Ltd.)

water, all that is necessary being to keep the inlet water over 100-120°F. to prevent "sweating," whilst the outside of the tubes are always cleaned by the scrapers, without the troubles involved in using blowers.

## Continental Chemical Notes

### Norway

CONSTRUCTION OF A NEW CARBIDE FACTORY with an annual capacity of 8 to 10,000 tons is planned in Notodden.

### Denmark

ACCORDING TO A CONSULAR REPORT the Copenhagen Municipality has purchased English equipment for the purpose of extracting benzole from illuminating gas.

### Poland

THE STATE NITROGEN WORKS at Moscice and Chorzow have commenced manufacture of dicalcium phosphate, the production capacity for which will eventually be increased to 30 to 40,000 tons.

### France

A DECLINE IN OUTPUT OF PETROLEUM from French wells during 1935 is reported by the S. A. d'Exploitations Minières de Pechelbronn, which secured a yield of 75,420 tons as compared with 78,100 tons in 1934.

### Germany

A PROCESS FOR DIRECT PRODUCTION OF GAS from crude lignite is reported to have been developed by the Wintershall A.G. of Berlin and Cassel. The process will be operated by the Mitteldeutsche Treibstoff-und Oelwerke A.G. which has been specially formed in this connection with an initial share capital of 500,000 marks by the Wintershall concern. Tests of the new process have been made in the Rauxel Nitrogen Works. It is further proposed to apply the Fischer-Tropsch process to conversion of the initial gaseous products into benzene.

### Russia

MONTAN WAX IS NOW BEING MADE FROM LIGNITE at "Factory No. 93," where a production of 100 tons is anticipated for the current year ("Sa Industrialisaziju").

TWELVE NEW OIL REGENERATING PLANTS of 15,000 tons annual capacity are now under construction in various parts of the Soviet Union.

THE SYNTHETIC RUBBER FACTORY at Sumgait, near Baku, where natural gas forms the raw material, is reported to have reached a production capacity of 13,000 to 15,000 tons rubber.

THE RECENTLY ESTABLISHED INSTITUTE FOR FOSSIL FUELS has succeeded in preparing liquid motor fuels from rotted peat sludge which is coked in shaft kilns in 60 ton batches to give a product containing 35 per cent. coke and 40 per cent. tar liquor (the latter containing 3 per cent. ammonia and 12 per cent. tar). Distillation of the tar yields 10 per cent. benzene, 25 per cent. kerosene, 20 per cent. lubricating oil, 10 to 12 per cent. paraffin wax, 8 to 10 per cent. pyridine bases and a residue of pitch.

SEVERAL DEVELOPMENTS IN THE RARE METAL FIELD have been recently reported. Caesium metal and its salts are now being made on an experimental scale at Odessa, utilising lepidolite from the Urals as raw material. Production in the past year amounted to about 100 grams metal and 3 kilograms salts, while production of 12 kilograms caesium and rubidium salts is aimed at during the current year. Indium has been discovered in the residues from the zinc smelting plant at Constantinovka and attempts are to be made to isolate the metal.

## British Production of Dyestuffs

### Main Classes of Output for 1935 Compared with Previous Years

THE current issue of "The Board of Trade Journal" contains the following statements showing the quantities of the various main classes of dyestuffs which were produced in the

United Kingdom during the year 1935 and the total production of dyestuffs for the past fourteen years. These statements have been prepared from returns furnished by the dyemakers.

PRODUCTION OF SYNTHETIC ORGANIC DYE STUFFS IN THE UNITED KINGDOM DURING THE YEAR 1935										
Category.		Blacks.	Blues.	Browns.	Greens.	Oranges.	Reds.	Violets.	Yellows.	Total.
		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Direct cotton dyestuffs .. ..		3,612,025	1,924,192	1,113,489	256,429	558,864	1,303,907	170,255	1,556,499	10,494,850
Acid wool dyestuffs .. ..		2,278,488	2,079,486	328,329	642,877	1,191,516	2,429,526	888,288	1,559,961	11,398,471
Chrome and mordant dyestuffs (including alizarine) .. ..		2,924,165	687,436	1,112,805	46,594	372,268	1,720,073	25,816	364,909	7,254,066
Basic dyestuffs .. ..		3,318	619,650	260,868	345,924	175,828	943,011	573,671	611,809	3,534,079
Sulphide dyestuffs .. ..		6,101,704	717,204	1,152,903	118,212	25,893	8,331	—	103,379	8,227,626
Vat dyestuffs (including indigo) ..		228,895	6,962,130	305,864	1,532,866	265,081	285,984	176,863	189,569	9,947,252
Lake making and pigment dyestuffs		117,112	32,370	1,708	162,108	2	1,378,021	10,281	245,549	1,947,151
Cellulose acetate silk dyestuffs ..		495,697	777,505	—	—	139,012	99,886	169,378	119,738	1,801,216
Oil, spirit and wax dyestuffs .. ..		512,468	607,704	23,277	1,704	23,871	36,768	33,507	52,202	1,291,501
Unclassified .. ..		103,394	18,740	45,604	1,544	5,878	28,503	3,744	47,060	*2,817,172
Aggregate total .. ..		16,377,266	14,426,417	4,344,847	3,108,258	2,758,213	8,233,200	2,051,803	4,850,675	58,713,384

\* Including quantities not separately distinguished.

SUMMARY OF PRODUCTION OF SYNTHETIC ORGANIC DYE STUFFS IN THE UNITED KINGDOM, 1922-35									
Year.	Total.	Year.	Total.	Year.	Total.	Year.	Total.	Year.	Total.
	lb.		lb.		lb.		lb.		lb.
1922 ..	23,832,967	1925 ..	32,693,402	1928 ..	50,960,472	1931 ..	48,621,073	1934 ..	52,925,636
1923 ..	33,100,719	1926 ..	30,297,000	1929 ..	55,785,032	1932 ..	49,380,266	1935 ..	58,713,384
1924 ..	33,242,704	1927 ..	39,551,756	1930 ..	42,590,243	1933 ..	52,944,866		

## Society of Glass Technology

### 19th Annual General Meeting

At the annual general meeting of the Society of Glass Technology held at Sheffield on April 22, Mr. Bernard P. Dudding was re-elected president for a second year. Mr. H. A. Bateson and Mr. F. W. Hodkia, B.Sc., F.I.C., were elected vice-presidents to fill vacancies due to retirement. According to the society's constitution and rules five members of the council were also due to retire and the following were elected in their places: Messrs. A. Cousen, P. Haller, L. E. Norton, J. Wilson and F. Hugo Wood. The following officers were re-elected: general treasurer, F. G. Orme; American treasurer, F. C. Flint; general secretary, Professor W. E. S. Turner; the auditors, C. E. Ramsden and A. J. Somers.

The annual report showed that the society had 695 members on the roll on December 31, 1935. Of this total 251 were resident in over 20 countries abroad, including 118 in the United States. The financial position of the society was satisfactory, there being a surplus of income over expenditure for the year. The rules were amended so as to provide for the institution of a new grade of membership, namely, that of Fellow.

Professor W. E. S. Turner delivered a memorial lecture on "Otto Schott and his Work."

In a paper on "Residual Sulphate in Soda-Lime-Silica Glasses and the Rate of its Elimination with Time and Temperature," Dr. Eric Preston, B.Sc., and Professor W. E. S. Turner said that soda-lime-silica glasses, approximately 74 SiO<sub>2</sub>, 10 CaO and 16 per cent. Na<sub>2</sub>O, containing from 0.31 to 0.83 per cent. SO<sub>3</sub> were heated in an electric furnace in an oxidising atmosphere at 1,300°C., 1,350° and 1,400° for periods up to 200 hours. The rate of sulphate elimination was proportional to the initial sulphate content, 100 hours heating at 1,400° reducing the sulphate content to about one half, and at 1,350° to about three-quarters of its initial value. Comparison of the analyses of the original glasses with earlier work indicated that 0.8 per cent. SO<sub>3</sub> was

an average figure for the maximum amount of SO<sub>3</sub> retained by such glasses, irrespective of the amount of saltcake present in the batch. This figure agreed well with earlier work in the Department of Glass Technology at Sheffield. The presence of sulphate appeared to increase slightly the loss of alkali by volatilisation.

## The John Benn Hostel

### Important Developments Foreshadowed

BIG developments of the work of the East End Hostels Association were forecast in the annual report of the warden of the John Benn Hostel, Mr. Aubrey Townshend. The matter was amplified by Sir Ernest Benn, president, at the annual meeting of the Association on May 6.

Sir ERNEST BENN, in moving the adoption of the warden's report, reminded his hearers that the Duke of York, speaking on behalf of King George's Jubilee Trust, had announced that the very first item in their programme was going to be hostels. That Trust had been good enough to look at the John Benn Hostel, and the president and warden were advising them on the problem. It was more than probable that before long the John Benn Hostel would be duplicated and triplicated. The King, when Prince of Wales, speaking in the Hostel, had said that there ought to be half-a-dozen such institutions set up without delay. It was gratifying that the efforts of the Association had been recognised.

Dr. J. J. MALLON, warden of Toynbee Hall, said that the time of institutions like the John Benn Hostel was coming. In the past shameful neglect had been shown in looking after the young people of the race. Two things were bringing about a remedy. One was the shrinkage of the juvenile population, and the other was the revelation made by Mr. John Orr of the under-nourishment from which young people were suffering. This had the effect of producing smallness of stature, and was a direct result of discontent of mind. The boys who were allowed to enter the John Benn Hostel had both those defects remedied.

# The Chemical Age Lawn Tennis Tournament

## Details of the First Round Draw

**E**NTRIES for the sixth annual CHEMICAL AGE Lawn Tennis Tournament closed on Monday and the draw for the first round was made at a meeting of the committee at Bouverie House on Tuesday afternoon. A total of 57 entries were received for the men's singles and 33 pairs entered for the men's doubles, both sections showing an increase over last year. While many of the entrants have taken part in previous tournaments a considerable proportion are newcomers and some keenly contested matches are anticipated. In the singles there are seven byes and 25 matches in the first round, and in the doubles there will be one preliminary match to reduce the number of pairs to 32 for the first round.

THE CHEMICAL AGE silver challenge cups will be presented to the winners, to be held for twelve months jointly by them and the firms they represent, and statuettes will be awarded to the winners and runners-up. The doubles cup has been won for the past three years by F. G. Hawley and J. Haines (Anglo-Iranian Oil Co.), who, on receiving the cup for the third time last September, signified their desire to hand it back for further competition. They are not playing in the doubles this year, although J. Haines, who also took the singles cup last year, is competing in the singles.

Entrants are urged to take immediate steps to arrange their matches as set out in the results of the draw published below, in accordance with the rules.

The competition is conducted on the knock-out principle, and the best of three advantage sets are to be played in all matches, except in the finals, when either the best of three

or the best of five sets will be played at the discretion of the Editor of THE CHEMICAL AGE and the members of the tournament committee present at the finals. The Editor, acting with the tournament committee, has the right to scratch any players who fail to play off their matches by the stipulated dates, or who otherwise fail to conform with the rules. Except in the case of the finals, players drawn against each other must make their own arrangements for playing off their match on a court mutually agreed upon. In the event of disagreement, the first name drawn shall have the right to choose the ground.

The result of each match must be sent by the winners to the Editor of THE CHEMICAL AGE, signed by all players (winners and losers), immediately after the match, and must reach the office of THE CHEMICAL AGE not later than by first post on the day following the final day for playing off the round. If any player be not present at the agreed place or time of the match, opponents shall be entitled to a walk-over, after having allowed reasonable time (say, a maximum of one hour) for the other's appearance.

All matches in the first round must be played by June 8, and the results received not later than first post on June 9. Results of the first round matches and details of the draw for the second round—a new draw being made for each round of the tournament—will be published as soon as the first round is completed. September 12 has been fixed as the date for the finals.

## Singles

### First Round

<b>Hughes, A. E.</b> Limmer & Trinidad Lake Asphalt Co., Ltd., Artillery House, Artillery Row, S.W.1. (Vic. 8313.)	<b>Jones, J. I. T.</b> The Mound Nickel Co., Ltd., Thames House, Millbank, London, S.W.1. (Vic. 5353, Ext. 8.)	<b>Liston, R. E. (Jnr.).</b> Walter Carsons & Sons, Ltd., Grove Works, Lombard Road, Battersea, S.W.11. (Battersea 2451, Ext. 31.)	<b>Thomsett, E. A.</b> The British Oxygen Co., Ltd., Angel Road, Edmonton, N.18. (Tottenham 2488.)
<b>Crosse, F. G.</b> Society of Chemical Industry (Bureau of Chemical Abstracts), 46/7, Finsbury Square, E.C.2. (Met. 3773.)	<b>Marcas, A. S.</b> Bovril, Ltd., 148/166, Old Street, London, E.C. (Clerkenwell 1202.)	<b>Lacy, E. D.</b> Murex Welding Processes, Ltd., Ferry Lane Works, Forest Road, E.17. (Larkwood 2284.)	<b>Copp, C. G.</b> Doulton & Co., Ltd., Lambeth, S.E.1. (Reliance 1241.)
<b>Marange, L. A.</b> Bakelite, Ltd., 68, Victoria Street, S.W.1. (Vic. 5441.)	<b>Smith, P.</b> Bakelite, Ltd., 68, Victoria Street, S.W.1. (Vic. 5441.)	<b>Francis B. T.</b> Bakelite, Ltd., 68, Victoria Street, S.W.1. (Vic. 5441.)	<b>Waters, H. G.</b> Anglo-Iranian Oil Co., Ltd., Britannic House, Finsbury Circus, E.C. (National 1212.)
<b>Bowald, D.</b> The British Drug Houses, Ltd., Graham Street, City Road, London, N.1. (Clerkenwell 3000.)	<b>Turner, J. H. W.</b> Griffiths Bros. & Co. (London), Ltd., Macks Road, Bermondsey, S.E.16. (Bermondsey 1151.)	<b>Bruce, R. N. B. D.</b> South-Eastern Gas Corporation, 84, Horseferry Road, S.W.1. (Vic. 8100, Ext. 204.)	<b>Hoppe, W.</b> Johnson Matthey & Co., Ltd., 78, Hatton Garden, E.C.1. (Hol. 6989 (Mr. Braby).)
<b>Seabrook, L.</b> British Oxygen Co., Ltd., Angel Road, Upper Edmonton, N.18. (Tottenham 2488.)	<b>Lewis, W. R.</b> The British Oxygen Co., Ltd., Angel Road, Upper Edmonton, N.18. (Tottenham 2488.)	<b>Truslove, A. J.</b> Johnson Matthey & Co., Ltd., 78, Hatton Garden, E.C.1. (Hol. 6989 (Mr. Braby).)	<b>Bloxam, T. C. S.</b> Le Grand, Sutcliffe & Gell, Ltd., The Green, Southall, Middx. (Southall 2211.)
<b>Eager, J.</b> Griffiths Bros. & Co. (London), Ltd., Macks Road, Bermondsey, S.E.16. (Bermondsey 1151.)	<b>O'Brien, P. D.</b> B. Laporte, Ltd., Luton, Beds. (Luton 891.)	<b>Tunstall, P. A.</b> Salt Union, Ltd., Colonial House, 20, Water Street, Liverpool. (Central 4370.)	<b>Hawley, F. G.</b> Anglo-Iranian Oil Co., Ltd., Britannic House, Finsbury Circus, E.C. (National 1212.)
<b>Badger, E. H. M.</b> Gas Light & Coke Co., No. 1 Laboratory, Fulham, S.W.6. (Fulham 5531, Ext. 10.)	<b>Hanson, G. A.</b> Whiffen & Sons, Ltd., Carnwath Road, Fulham, S.W.6. (Fulham 0037.)	<b>Blow, D. G.</b> British Drug Houses, Ltd., 16-30, Graham Street, City Road, London. (Clerkenwell 3000.)	<b>Bennett, R. A. J.</b> Nobel Chemical Finishes, Ltd., Wexham Road, Slough, Bucks. (Slough 528.)
<b>Williams, R. M. O.</b> Chance & Hunt, Ltd., 5-7, St. Helen's Place, London, E.C.3. (National 4024, Ext. 7.)	<b>Seap, R. J.</b> United Yeast Co., Ltd., 238, City Road, London, E.C.1. (Clerkenwell 0303, Ext. 3.)	<b>Prosser, V. J.</b> John Haig & Co., Ltd., 2, Pall Mall East, S.W.1. (Whitehall 1040.)	<b>Walton, G.</b> The British Oxygen Co., Ltd., Angel Road, Edmonton, N.18. (Tottenham 2647.)
<b>Steel, H. A.</b> Society of Chemical Industry, Central House, 46/47, Finsbury Square, E.C.2. (Met. 3773.)	<b>Welsh, R. F.</b> The British Oxygen Co., Ltd., Angel Road, Edmonton, N.18. (Tottenham 2488.)	<b>Hand, F. D.</b> B. Laporte, Ltd., Luton, Beds. (Luton 891.)	<b>Pugh, G.</b> British Oxygen Co., Ltd., Angel Road, Edmonton, N.18. (Tottenham 2488.)
<b>Baxter, A.</b> United Yeast Co., Ltd., 238, City Road, London, E.C.1. (Clerkenwell 0303.)	<b>Haines, J.</b> Anglo-Iranian Oil Co., Ltd., Britannic House, Finsbury Circus, E.C. (National 1212.)	<b>Hudson, J.</b> Bakelite, Ltd., 68, Victoria Street, London, S.W.1. (Vic. 5441.)	<b>Lewis, A. S.</b> Stafford Allen & Sons, Ltd., 7, Cowper Street, E.C.2. (Clerkenwell 2100.)
<b>Gouldie, A. W. A.</b> Tar Residuals, Ltd., 4, Lloyd's Avenue, E.C.3. (Mayfair 8000, Ext. 218.)	<b>Brewer, G.</b> British Celanese, Ltd., Celanese House, 22 & 23, Hanover Square, London, W.1. (Mayfair 8000, Ext. 218.)	<b>Pavitt, E.</b> Co-operative Wholesale Society, Drug Works, Greenside Lane, Droylsden, Manchester. (Droylsden 1348.)	<b>Whittaker, E.</b> A. C. Wells & Co., Ltd., Carnarvon Street, Cheetham, Manchester. (Blackfriars 8044.)
<b>Cosgrove, A.</b> Hanovia, Ltd., Bath Road, Crippenham, Slough, Bucks. (Burnham (Bucks) 500.)	<b>Lucas, P. L.</b> British Drug House, Ltd., Graham Street, City Road, London, N.1. (Clerkenwell 3000.)	<b>Cornelius, L.</b> Stafford Allen & Sons, Ltd., 7, Cowper Street, Finsbury, E.C.2. (Clerkenwell 2100.)	<b>Grape, L. F.</b> Borax Consolidated, Ltd., Regis House, King William Street, E.C.4. (Mansion House 8332.)
<b>Wakeman, W.</b> Johnson Matthey & Co., Ltd., 78, Hatton Garden E.C.1. (Hol. 6989 (Mr. Braby).)	<b>Tiekner, A.</b> British Celanese, Ltd., Celanese House, Hanover Square, W.1. (Mayfair 8000, Ext. 137.)		
<b>Wilson, J. S.</b> British Celanese, Ltd., 22/3, Hanover Square, London, W.1. (Mayfair 8000, Ext. 137.)	<b>Killick, A. A.</b> B. Laporte, Ltd., Luton, Beds. (Luton 891.)		

## Byes

**Hayman, R. D.**Doulton & Co., Ltd., Lambeth,  
S.E.1. (Reliance 1241.)**Thompson, V. D.**Stafford Allen & Sons, Ltd., 7,  
Cowper Street, London, E.C.2.  
(Clerkenwell 2100.)**Gough, C. C.**Lever Bros., Ltd., C.T.D/G. Dept.,  
Port Sunlight, Cheshire. (Rock  
Ferry 500.)**Woodcock, C. T.**British Tar Products, Ltd., Hayes  
Road, Cadishead, Manchester.  
(Irlam 87.)**Neason, F.**Alfd. Herbert, Ltd., Edgwick Works,  
Foleshill, Coventry. (Coventry  
8781.)**Doubles****Preliminary Match****Jones, J. I. T. & Williams, R. M. O.**Mond Nickel Co., Ltd., Thames  
House, Millbank, London, and  
Chance & Hunt, Ltd., 5-7, St.  
Helen's Place, London, E.C.3.  
(Victoria 5353, Ext. 8; National  
4024, Ext. 7.)**Steel, H. A., & Jaffe, D. H.**Society of Chemical Industry,  
Central House, 46/47, Finsbury  
Square, E.C.2, and Lever Bros.,  
Ltd., Unilever House, London.  
(Met. 3773.)**First Round****Bovaird, D., & Lucas, P. L.**British Drug Houses, Ltd., Graham  
Street, City Road, London, N.1.  
(Clerkenwell 3000.)

Winner of Preliminary Match.

**Triggs, A. E., & Tinkler, R.**Murex Welding Processes, Ltd.,  
Ferry Lane Works, Forest Road,  
Walthamstow, E.17. (Larkwood  
2284.)**Allen, F. R. O., & Bennett, R. A. J.**Nobel Chemical Finishes, Ltd.,  
Wexham Road, Slough, Bucks.  
(Slough 528.)**Champkin, R. H., & Muckleston, C. J.**B. Laporte, Ltd., Luton, Beds.  
(Luton 891.)**Blow, D. G., & Cripps, V. G.**British Drug Houses, Ltd., City  
Road, London, N.1. (Clerkenwell  
3000.)**Willshire, A. E. C., & Grape, L. F.**Borax Consolidated, Ltd., Regis  
House, King William Street,  
London, E.C.4. (Mansion House  
8332.)**Killick, A. A., & Brittain, G. A.**B. Laporte, Ltd., Luton, Beds.  
(Luton 891.)**Thompson, V. D., & Lewis, A. S.**Stafford Allen & Sons, Ltd., 7,  
Cowper Street, E.C.2. (Clerkenwell  
2100.)**McThiesen, G., & Hole, G. W.**Asiatic Petroleum Co., Ltd., St.  
Helen's Court, E.C.3. (Avenue  
9820.)**O'Brien, P. D., & Hand, F. D.**B. Laporte, Ltd., Luton, Beds.  
(Luton 891.)**Tickner, A., & Wilson, J. S.**British Celanese, Ltd., Hanover  
Square, W.1. (Mayfair 8000,  
Ext. 137.)**Brewer, G. J., & Goudie, A. W. A.**British Celanese, Ltd., 23, Hanover  
Square, W.1, and Tar Residuals,  
Ltd., 4, Lloyds Avenue, E.C.3.  
(Mayfair 8000, Ext. 218.)**Truslove, A. J., & Wakeman, W.**Johnson Matthey & Co., Ltd.,  
78, Hutton Garden, E.C.1. (Hol.  
6989 (Mr. Braby).)**Eyres, A. F., & Hoppe, W.**Johnson Matthey & Co., Ltd., 78,  
Hutton Garden, E.C.1. (Hol. 6989  
(Mr. Braby).)**White, A. W., & Hornsby, R. H.**Howards & Sons, Ltd., Uphall  
Works, Ilford. (Ilford 1113.)**Eager, J., & Turner, J. H. W.**Macks Road, Bermondsey, London,  
S.E.16. (Bermondsey 1151.)**Prosser, V. J., & Baxter, A.**John Haig & Co., Ltd., 2, Pall Mall  
East, S.W.1, and United Yeast Co.,  
Ltd., 238, City Road, E.C.1.  
(Whitehall 1040; Clerkenwell 0303.)**Crosse, F. G., & Walker, J. E.**Society of Chemical Industry,  
46/7, Finsbury Square, E.C.2,  
and National Farmers' Union, 45,  
Bedford Square, W.C.1. (Met.  
3773 and Mus. 7525.)**Speakman, W., & Chaloner, S. E.**Monsanto Chemicals, Ltd., Ruabon,  
North Wales. (Ruabon 3, or  
Wrexham 2500 after 7 p.m.)**Gough, C. C., & Williams, T. P.**Lever Bros., Ltd., Port Sunlight,  
Cheshire. (Rock Ferry 500.)**Bennett, J. H., & Hayward, J. E. H.**Bakelite, Ltd., Redfern Road,  
Tyseley, Birmingham. (Acocks  
Green 1181.)**Woodcock, C. T., & Hardern, V.**British Tar Products, Ltd., Hayes  
Road, Cadishead, Manchester.  
(Irlam 87.)**Hayman, R. D., & Copp, C. G.**Doulton & Co., Ltd., Lambeth,  
S.E.1. (Reliance 1241.)**Francis, B. T., & Smith, P.**Bakelite, Ltd., 68, Victoria Street,  
S.W.1. (Vic. 5441.)**O'Connor, F., & Lacy, E. D.**Murex Welding Processes, Ltd.  
Ferry Lane Works, Forest Road  
E.17. (Larkwood 2284.)**Sleap, R. J., & Bulison, J.**United Yeast Co., Ltd., 238, City  
Road, London, E.C.1, and Honey-  
will & Stein, Ltd., 15, Regent Street,  
W.1. (Clerkenwell 0303, Ext. 3.)**Maronge, L. A., & Hudson, J.**Bakelite, Ltd., 68, Victoria Street,  
London, S.W.1. (Victoria 5441.)**Boyd, J. S., & Manlove, D. A.**Imperial Chemical Industries, Ltd.,  
Grangemouth. (Grangemouth 182.)**Allday, E. J., & Parkes, J. W.**Bakelite, Ltd., Redfern Road,  
Tyseley, Birmingham. (Acocks  
Green 1181.)**Barnett, G., & Ball, H. H.**Bakelite, Ltd., Redfern Road,  
Tyseley, Birmingham. (Acocks  
Green 1181.)**Whittaker, E., & Taylor, H. C.**A. C. Wells & Co., Ltd., Carnarvon  
Street, Cheetham, Manchester, and  
H. C. Taylor, The Laboratories,  
Bury New Road, Prestwich, Man-  
chester. (Bla. 8044 and Pre. 1525.)**Personal Notes**

MR. AUGUSTUS WHILE, of Hollow Oak, Haverthwaite, Lancs, a director of the Charcoal Iron Co. of Backbarrow, Lancs, left £22,051 (net personality £12,530).

SIR HENRY ARTHUR COLEFAX, K.C., of Chelsea, an authority on patent and trade mark law, who died in February last, left gross estate of the value of £29,416, with net personality £12,419.

MAJOR SIR CHARLES A. MANDER is the chairman of an Industrial Advisory Council which has been formed to further the National Savings scheme in the sphere of industry. Among the members are Lord Leverhulme, Sir Harry McGowan, Sir Josiah Stamp and Lord Trent.

MR. CHARLES E. TOPHAM, who played an important part in the invention of the viscose rayon spinning process, died suddenly at Coventry on May 10, aged 73. Mr. Topham had frequently had to discontinue his viscose experiments in order to devote his time to the electric lamp manufacturing business, and in 1904, after a brief connection with Courtaulds, Ltd., he went out of the rayon industry altogether. He rejoined Courtauld's at Coventry in 1920 as an experimental engineer.

THE following were elected to membership at a meeting of the board of the Institute of Physics on Tuesday:—Fellows: D. H. Black, M.Sc., Ph.D.; C. M. Focken, B.Sc., B.M.E., D.Phil.; A. J. Maddock, M.Sc.; and G. F. Tagg, B.Sc., Ph.D., A.M.I.E.E. Associates: D. W. Davison, B.Sc.; H. G. Howell, B.Sc.; W. A. Johnson, B.A.; and T. H. Oddie, M.Sc. Ordinary member: A. Brookes, M.Eng., M.I.E.E. Students: D. E. Adams, C. C. Cradwick, A. H. M. Hytch, K. E. B. Jay, E. H. Jones, L. F. Lamerton, K. J. Milne, F. J. Turney, P. J. Rigden, J. C. K. Shipp and E. C. Williams.

MR. WILLIAM CORNWALL LEE, 84 Blairbeth Road, Burnside, Glasgow, of Peter Lee and Sons, Ltd., oil refiners, Glasgow, left £22,924.

MR. H. M. ABEL, chairman of Abel, Lemon and Co. Pty, Ltd., whose branches throughout Australia have for many years supplied raw materials for the industrial chemical trade, has arrived in London, accompanied by his son, Mr. E. V. Abel.

MR. H. P. COLES and MR. G. W. SCOTT have been elected directors of United Molasses Co., Ltd. Both Mr. Coles and Mr. Scott have been actively engaged in the business of the company for the past twenty years and will continue as managers.

MR. FRED CLEMENTS, of the Park Gate Iron and Steel Co., Rotherham, was presented on May 7 with the Bessemer Gold Medal, the highest award in the gift of the Iron and Steel Institute. The presentation was made by Sir Harold Carpenter, president of the Institute.

SIR ALEXANDER GIBB, consulting engineer, DR. J. KENYON, head of the chemistry department, Battersea Polytechnic, PROFESSOR N. F. MOTT, professor of theoretical physics, University of Bristol, and DR. R. G. W. NORRISH, lecturer in physical chemistry, University of Cambridge, are included in the list of seventeen new fellows elected to the Royal Society.

MR. RICHARD MORGAN, of Winsford, the oldest trade unionist in Mid-Cheshire and the oldest member of the Salt Makers' Association, and Mrs. Morgan, celebrated the 70th anniversary of their wedding on Wednesday. Mr. Morgan will be 90 in August and is still erect and active, but has lost his sight. Mrs. Morgan, who will be 90 next February, has for some time been an invalid.

## From Week to Week

THE 73rd ANNUAL RECEPTION AND DANCE of the Institution of Gas Engineers will be held at Grosvenor House, Park Lane, London, on May 27. Col. W. Moncrieff Carr, president of the Institution, and Mrs. Carr will receive the guests.

THE HUNDREDTH PUMP serving petrol made from British coal was opened by Sir William Lane-Mitchell, M.P. for Streatham, at the Thames Petrol, Ltd., motor spirit service station at the corner of Streatham High Road and Green Lane on Wednesday.

THE NEW CARBONISATION BATTERY at the works of Coal and Allied Industries, Ltd., Seaham Harbour, for the production of oil from coal was started up on May 7, when the works were visited by Lord Eldon, chairman of the company, and Mr. A. Fisher, the consulting engineer. It is understood the works will shortly be in full production.

REPRESENTATIONS have been made to the Board of Trade for the exemption of zirconium oxide and kryofin (methoxy acetparaphenetidine) from Key Industry Duty under Section 10(5) of the Finance Act, 1926. Any communications with regard to either of these representations should be addressed to the Principal Assistant Secretary, Industries and Manufactures Department, Board of Trade, Great George Street, S.W.1, not later than June 6.

THE "DAILY MAIL" recently published a "Poy" cartoon headed "Europe's Shirt," illustrating the destructive effects of modern political influences and below the cartoon appeared the words "International Pulveriser, No. 1." A week later it published an apology to International Pulverisers, Ltd., remarking that, needless to say, the cartoonist had no intention of ridiculing that company's business or its machinery.

THE ADDITION OF OPHTHALMIC TREATMENT to the usual staff welfare service is a suggestion about to be urged by the Joint Council of Qualified Opticians. Certain chemical works have expressed their approval of the principle of ophthalmic welfare, and a widespread adoption of the scheme is hoped for. It is pointed out that the efficiency of workers is greatly reduced by the presence of unsuspected eye-defects or by the wearing of unsuitable spectacles.

HOLDERS OF THE PREFERRED AND DEFERRED ORDINARY SHARES of Borax Consolidated, Ltd., are to be given an opportunity to take up a new issue of deferred shares on terms that will provide them with a small capital bonus. 150,000 deferred shares of £1 each will be offered for subscription to the preferred and deferred shareholders at 27s. per share. The total number of preferred and deferred shares issued at present is 1,270,000, so that, presumably, holders will be entitled to take up one new deferred for every eight shares now held.

THERE ARE HOPES IN CARDIGANSHIRE that once again there will be at least some activity at the disused lead-mines in the north of the county. Investigations are being made into the possibility of developing the mines and using the dumps at Cwmystwyth, and application has been made to the county council for permission to cross the highway by small trucks or by gantry. There are rumours that the old silver mines at Llanfairlydogau, near Lampeter, are to be explored. The Roman gold-mine at Pump-saint is already being worked.

SIMON-CARVES, LTD., of Cheadle Heath, Stockport, have received an order from Amalgamated Anthracite Collieries, Ltd., for a new boiler plant which is to be installed at the No. 3 Great Mountain Colliery, near Swansea. The contract includes two multiple drum-type water-tube boilers, with patent water wall combustion chambers and water-cooled suspension arches. Each boiler will have a maximum evaporative capacity of 36,000 lb. of water per hour, and will be equipped with a chain grate stoker, economiser, forced and induced draught fans. They are also to supply the coal-handling plant, feed pumps, boiler-house building and chimney, and all auxiliaries. The boilers are designed to burn anthracite duff which will contain a large proportion of aspirated dust obtained from the colliery screening plant.

WORK IS NEARING COMPLETION on the construction at Blacker, near Wombwell, of what will be one of the largest coking and by-product plants in the North of England, and it is expected that the establishment will be "in process" by the end of June or early in July. The works, which are being erected by the Woodall-Duckham Co., for the Barnsley and District Coking Co., occupy about 15 acres of what hitherto was ploughland. Coking slack will be received by aerial ropeways from three collieries, Wombwell Main, Barnsley Main and Barrow. There has been constructed at Barrow Colliery a British Baum coal washery of 160 tons an hour capacity at which slack will be washed and graded before being conveyed to the new plant. From the plant a 12-inch pipe laid under the towing path of the South Yorkshire Canal, will convey the gas produced to various works at Barnsley, four miles away. Motor spirit will also be produced, and a feature is that the ovens will be heated by gas produced in them. The project is being developed under the direction of Mr. William Hay. Mr. F. Cooke, of Wombwell Main Colliery, has been appointed manager, and Mr. E. Outwin, engineer of the new plant.

THREE THOUSAND GALLONS OF TAR WERE DESTROYED by an outbreak of fire which occurred on May 10 at the Dawsholm Chemical Works of Glasgow Corporation in Maryhill, Glasgow. The loss is estimated at £1,500.

THE DEMANDS for activated carbons produced by Sutcliffe, Speakman and Co., Ltd., Leigh, Lancashire, and the increasing inquiries for them, compel the company to acquire additional extensive premises to augment its output and fulfil contracts.

STEEL WORKERS RACED FOR THEIR LIVES when a tank containing several hundred gallons of whale oil burst into flames at the works of F. Flather and Co., Ltd., Standard Steelworks, Sheffield, on May 6. Flames shot to a height of 40 feet, and at one time the whole of the works was threatened. The tank was used in the process of tempering special steel.

THE CORPORATION OF VIENNA, in order to guard against breakdowns or other emergencies, as well as to economise on peak-load demands, has decided to erect a special steam storage plant as an instantaneous stand-by. This special plant is on an entirely new steam-accumulator system, working to the highest pressure range under a system developed by the engineering firm, Wiener Lokomotiv-Fabriks, A.G., working in collaboration with Ruths International Accumulators, Ltd., London.

A THANKSGIVING SERVICE FOR THE ESTABLISHMENT of two new rayon factories by Courtaulds, Ltd., at Greenfield, and for the return of prosperity to the Greenfield Valley and Flintshire, was held at Holywell Parish Church, on May 10. It was attended by workers and their wives and families, representatives of the directorate of Courtaulds, and other manufacturers in the district, and members and officials of the Holywell U.D.C., Holywell R.D.C., Flint Town Council, and the Flintshire County Council. The sermon was preached by the Bishop of St. Asaph.

THE HAWKSTOR CHINA CLAY WORKS have decided to restore the full cut of a penny per hour, making one shilling per hour, and to give all their employees of over a year's service a week's holiday with pay. The Hawkstor Works have been acquired by Bowaters, the paper-making firm, and in order to get a move on in business Mr. Baker, the chairman, and Mr. Skynner, the local managing director, are anxious to secure the hearty co-operation of the whole of their employees. A large filter pressing plant has been installed at the Hawkstor Works and is working highly satisfactorily, which has considerably increased the yearly output.

SIR DAVID MILNE-WATSON announced at the annual meeting of the South Eastern Gas Corporation on Wednesday that considerable improvements and extensions had been made to the manufacturing plant at the works of several of the companies under the Corporation's control, including the erection of new holders to give additional storage and so safeguard the continuity of supply. One more benzole plant had been installed during the year, so that four of their works were now producing benzole and increasing the supply of home-produced motor spirit well known under the name of National Benzole Mixture. A benzole recovery plant not only provided a source of revenue to the company which owned it, but was of national advantage since it increased the consumption of coal and rendered the country less dependent on imported oil, and the corporation was, therefore, proposing to install plants at several other works.

FRENCH, GERMAN, ITALIAN, AND OTHER EUROPEAN EXPERTS are attending the International Congress on Glass, which will be held in London and Sheffield, July 2-11. The London headquarters will be the Institution of Electrical Engineers. The first congress was held in Milan three years ago. Mr. Bernard P. Dudding (president of the Society of Glass Technology) will preside. Professor W. E. S. Turner (Sheffield University) is the general organising secretary. Technical discussions will cover the improvement of specifications and standards and better international co-operation in regard to them; the manufacture and properties of glass and the methods of its chemical analysis; refractory materials, fuels, and furnaces; and the manipulation, form, design and decoration of glass, and the correlation of technical knowledge and artistic ideas in the manufacture of glass by mechanical processes.

MR. JUSTICE CLAUSON, in the Chancery Division, on Tuesday, made an order to strike out the name of Clarence Young on the register of Imperial Chemical Industries as the holder of certain shares, substituting the name of Dr. Helen Mary Gordon Clark. Mr. Gilbert Paull, who appeared for Dr. Clark, a widow, said she was induced to part with a number of shares in I.C.I. as collateral security for the purchase of other shares through a large pool alleged to be backed with £250,000. Dr. Clark executed documents which she said were not transfers at all. The documents were not in the ordinary transfer form. She never intended to part with the true possession of the shares, added Mr. Paull, and no title to them could pass to Clarence Young. Dr. C. A. Mitchell, a handwriting expert, said he considered that the signatures on the transfer documents were either genuine or the work of an abnormally clever forger.

## Weekly Prices of British Chemical Products

PRICES of British chemical products have remained steady during the past week. Unless otherwise stated the prices below cover fair quantities net and naked at sellers' works.

MANCHESTER.—Rather inactive trading conditions have been experienced during the past week on the Manchester chemical market so far as new bookings are concerned, and except for a relatively small number of contract renewals business has been of only moderate extent in the aggregate and of odd lots. Delivery specifications, however, have been reasonably satisfactory so far this month and the majority of users are taking regular

supplies. Consumption in the textile industry locally is much below normal, although, on the whole, the movement of chemicals for the cotton finishing and dyeing trades has been maintained at its recent level. So far as the general run of chemicals is concerned the price position is steady. In the by-products market, however, although actual values are not appreciably altered the undertone in a number of sections is easy.

SCOTLAND.—There has been a steady day to day demand for chemicals during the week, both for home trade and export. Prices generally continue very firm at about previous figures.

### General Chemicals

ACETONE.—LONDON: £62 to £65 per ton; SCOTLAND: £64 to £65 ex wharf, according to quantity.

ACID, ACETIC.—40% technical, £16 12s. 6d. per ton. LONDON: Tech., 80%, £30 5s. to £32 5s. per ton; pure 80%, £32 5s. to £34 5s.; tech., 40%, £16 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £32 5s.; tech., 80%, £30 5s., d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £30 5s.; tech. glacial, £48 to £50.

ACID, BORIC.—Commercial granulated, £27 per ton; crystal, £28; powdered, £29; extra finely powdered, £31; packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. B.P. cryst., £36; B.P. powder, £37. SCOTLAND: Crystals, £28; powdered, £29.

ACID, CHROMIC.—Flaked, 10d. per lb., less 2½%; ground, 10½d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—1s. per lb. MANCHESTER: 1s. SCOTLAND: 11½d.

ACID, CRESYLIC.—97/100%, 1s. 5d. to 1s. 6d. per gal.; 99/100%, refined, 1s. 9d. to 1s. 10d. per gal. LONDON: 98/100%, 1s. 5d. f.o.r.; dark, 1s.

ACID, FORMIC.—LONDON: £42 to £47 per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works. SCOTLAND: 80°, £24 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £48 to £50 ex store. MANCHESTER: £48 10s. to £55 ex store.

ACID, SULPHURIC.—SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—1s. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. LONDON: 11½d., less 5%. SCOTLAND: 1s. 0½d. less 5%. MANCHESTER: 1s. per lb.

ALUM.—SCOTLAND: Lump potash, £8 10s. per ton ex store.

ALUMINA SULPHATE.—LONDON: £7 10s. to £8 per ton. SCOTLAND: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—SCOTLAND: Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—LONDON: Fine white crystals, £18 to £19. (See also Sal ammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Sal ammoniac.)

AMMONIUM SULPHATE.—Neutral quality, 20.6% nitrogen, £7 per ton.

ANTIMONY OXIDE.—SCOTLAND: £61 to £65 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden, 6½d. to 1s. 1d. per lb.; crimson, 1s. 5½d. to 1s. 7d. per lb., according to quality.

ARSENIC.—LONDON: £15 per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines.

SCOTLAND: White powdered, £23 ex wharf. MANCHESTER: White powdered Cornish, £21 ex store.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—LONDON: £10 10s. per ton. SCOTLAND: £10 10s. to £10 15s.

BARYTES.—£6 10s. to £8 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot, 35/37%, £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £9 5s.

BORAX, COMMERCIAL.—Granulated, £14 10s. per ton; crystal, £15 10s.; powdered, £16; finely powdered, £17; packed in 1-cwt. bags, carriage paid home to buyer's premises within the United Kingdom in 1-ton lots.

CADMIUM SULPHIDE.—5s. 1d. to 5s. 4d. per lb.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£31 to £33 per ton, drums extra.

CARBON BLACK.—3½d. to 4½d. per lb. LONDON: 4½d. to 5d.

CARBON TETRACHLORIDE.—SCOTLAND: £41 to £43 per ton, drums extra.

CHROMIUM OXIDE.—10½d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 2½d. per lb.; liquor, £19 10s. per ton d/d

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—£3 19s. per cwt. less 2½%. LONDON: £3 17s.

per cwt. SCOTLAND: £3 16s. 6d. net.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £24 10s. per ton. SCOTLAND: 40%,

£25 to £28 ex store.

IODINE.—Resublimed B.P., 6s. 3d. to 8s. 4d. per lb.

LAMPBLACK.—£40 to £43 per ton.

LEAD ACETATE.—LONDON: White, £36 10s. per ton; brown, £1 per

ton less. SCOTLAND: White crystals, £34 to £35; brown, £1

per ton less. MANCHESTER: White, £36; brown, £35.

LEAD NITRATE.—£32 10s. to £34 10s. per ton.

LEAD, RED.—SCOTLAND: £26 to £28 per ton less 2½%; d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: £41.

LITHOPONE.—30%, £16 5s. to £16 10s. per ton.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—SCOTLAND: £7 per ton.

MAGNESIUM SULPHATE.—Commercial, £5 per ton, ex wharf.

PHENOL.—6½d. to 7½d. per lb.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £38.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. less

5%, d/d U.K. Ground, 5½d. LONDON: 5d. per lb. less

5%, with discounts for contracts. SCOTLAND: 5d. d/d U.K.

or c.i.f. Irish Ports. MANCHESTER: 5d.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND:

99½/100%, powder, £37. MANCHESTER: £39.

POTASSIUM CHROMATE.—6½d. per lb. d/d U.K.

POTASSIUM IODIDE.—B.P., 5s. 2d. per lb.

POTASSIUM NITRATE.—SCOTLAND: Refined granulated, £29 per ton

c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 8½d. per lb. SCOTLAND:

B.P. crystals, 10d. to 10½d. MANCHESTER: B.P., 11½d.

POTASSIUM PRUSSIAN.—LONDON: Yellow, 8½d. to 8½d. per lb.

SCOTLAND: Yellow spot, 8½d. ex store. MANCHESTER: Yellow,

8½d. to 8½d.

SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in

barrels. SCOTLAND: Large crystals, in casks, £36.

SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, £13 17s. 6d. per ton d/d station.

SCOTLAND: Powdered 98/99%, £17 10s. in drums,

£18 5s. in casks, Solid 76/77°, £14 12s. 6d. in drums; 70/73%,

£14 12s. 6d., carriage paid buyer's station, minimum 4-ton

lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to

£14 contracts.

SODIUM ACETATE.—LONDON: £21 per ton. SCOTLAND: £20 15s.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station

in bags. SCOTLAND: Refined recrystallised £10 15s. ex quay

or station. MANCHESTER: £10 10s.

SODIUM BISULPHITE POWDER.—60/62%, £20 per ton d/d 1 cwt.

iron drums for home trade.

SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 12s. 6d. per

ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s.

per ton d/d. MANCHESTER: £3 2s. 6d. to £3 5s.

SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in

drums; crystals 30/32%, £8 per ton d/d in casks. SCOT-

LAND: For home consumption, Solid 60/62%, £10 5s.; broken

60/62%, £11 5s.; crystals, 30/32%, £8 7s. 6d., d/d buyer's

works on contract, min. 4-ton lots. Spot solid, 5s. per ton

extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Con-

centrated solid, 60/62%, £11; commercial, £8.

### Other Price Changes

ACID, CARBOLIC.—Crystals, 6½d. to 7½d. per lb.; crude, 60's,

2s. 3d. to 2s. 6d. per gal. MANCHESTER: Crystals, 6½d.

per lb.; crude, 2s. 2d. per gal. SCOTLAND: 60's, 2s. 6d. to

2s. 7d.

PITCH.—Medium, soft, 37s. 6d. per ton, in bulk at makers works.

MANCHESTER: 30s. to 32s. 6d. f.o.b., East Coast.

## Inventions in the Chemical Industry

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

### Specifications Open to Public Inspection

GLYCOLS FROM FATTY ACIDS, process for production.—Böhme Fettchemie-Ges. Oct. 31, 1934. 25382/35.  
ORGANIC COMPOUNDS CONTAINING BASIC SUBSTITUENTS, manufacture.—Aceta Ges. Nov. 1, 1934. 26550/35.  
DYEINGS AND PRINTINGS or cellulose esters and ethers, process for producing.—J. R. Geigy A.-G. Nov. 3, 1934. 28716/35.  
BLENDED PIGMENT.—Krebs Pigment and Color Corporation. Oct. 30, 1934. 29632/35.  
DIRECT DYESTUFFS, treatment.—Formerly Sandoz Chemical Works. Nov. 1, 1934. 29747/35.  
CRACKING OF HYDROCARBON OILS.—Gyro Process Co. Oct. 29, 1934. 29885/35.  
REFINING OF LEAD, process.—Soc Minière and Metallurgique de Penarroya. Nov. 2, 1934. 30110-1/35.  
CARBONACEOUS MATERIALS, treatment.—F. Uhde. Oct. 31, 1934. 30136/35.  
TETRAHYDRONAPHTHYLTHIOUREAS and tetrahydroaminonaphthothiazoles.—E. I. du Pont de Nemours and Co. Nov. 3, 1934. 30257/35.

### Specifications Accepted with Date of Application

ACETIC ANHYDRIDE, production.—H. E. Potts (Shawinigan Chemicals, Ltd.). July 25, 1934. 446,259.  
DISTILLATION OF COAL.—A. Roberts and C. W. Smith (Legal representatives of A. A. Roberts (deceased)), and J. E. Hackford. July 26, 1934. 446,412.  
WETTING PROPERTIES of aqueous liquids used for treating textiles and other fibrous materials, processes for improving.—Selden Co. July 28, 1933. 446,568.  
GASEOUS-FUEL MIXTURES, production.—Ruhchemie A.-G. July 31, 1933. (Addition to 444,315.) 446,493.  
TREATMENT OF COAL and other solid carbonaceous materials for use in subsequent hydrogenation processes.—C. Vieu. July 28, 1934. 446,494.  
TREATMENT OF TEXTILES.—W. W. Groves (I. G. Farbenindustrie). Aug. 22, 1934. 446,416.  
PRINTING WITH VAT DYESTUFFS.—W. W. Groves (I. G. Farbenindustrie). Sept. 22, 1934. 446,265.  
DYESTUFFS OF THE ANTHRAQUINONE-OXAZOLE series, capable of being chromed, manufacture.—W. W. Groves (I. G. Farbenindustrie). Sept. 28, 1934. 446,500.  
FROTH FLOTATION OF ORES.—American Cyanamid Co. Oct. 11, 1933. 446,418.  
CONDENSATION PRODUCTS containing nitrogen and sulphur, manufacture.—W. W. Groves (I. G. Farbenindustrie). Oct. 17, 1934. 446,269.  
ALCOHOLS from germinal gland hormones, process for manufacture.—Scherer-Kahlbaum A.-G. Oct. 21, 1933. 446,501.  
MANUFACTURE OF SOAP.—A. Paterson. Oct. 23, 1934. 446,342.  
DEGREASING APPARATUS.—W. E. Booth and Imperial Chemical Industries, Ltd. Oct. 23, 1934. 446,503.  
ACTIVE CARBON, process and apparatus for manufacture.—O. Heller. Oct. 25, 1933. 446,505.  
CONDENSATION PRODUCTS, manufacture.—I. G. Farbenindustrie. Oct. 25, 1933. 446,276.  
THIAZINE DYESTUFF, manufacture.—W. W. Groves (I. G. Farbenindustrie). Oct. 25, 1934. 446,574.  
HYDROCYANIC ACID, manufacture.—E. I. du Pont de Nemours and Co. Dec. 7, 1933. 446,277.  
RUBBER COMPOSITIONS and the manufacture thereof.—J. P. Baxter, F. P. Leach and Imperial Chemical Industries, Ltd. Oct. 25, 1934. 446,278.  
CHLORINATED RUBBER, manufacture of porous blocks from.—G. H. Preston and Imperial Chemical Industries, Ltd. Oct. 26, 1943. 446,285.  
COPPER-CONTAINING AZO DYESTUFF, manufacture and application. Imperial Chemical Industries, Ltd., and M. Mendoza. Oct. 29, 1934. 446,425.  
ROTENONE AND ASSOCIATED SUBSTANCES from natural sources containing the same, process of producing.—E. W. Fawcett and Imperial Chemical Industries, Ltd. Oct. 29, 1934. 446,576.  
AZO DYESTUFFS.—Imperial Chemical Industries, Ltd., and F. L. Rose. Oct. 30, 1934. 446,520.  
POLYMERISATION PRODUCTS, manufacture.—Dr. H. Staudinger. Nov. 1, 1933. 446,580.  
AMINO-TRIFLUOROMETHYL-ARYL-SULPHONIC ACIDS, manufacture.—W. W. Groves (I. G. Farbenindustrie). Nov. 2, 1934. 446,532.  
ANTI-HALATION LAYERS and filter layers, manufacture.—I. G. Farbenindustrie. Nov. 18, 1933. 446,583.  
AZO DYESTUFFS, manufacture.—W. W. Groves (I. G. Farbenindustrie). Nov. 3, 1934. 446,584.  
MIXTURES OF NITROGEN AND HYDROGEN practically free from

oxygen and oxides of nitrogen and apparatus therefor, manufacture and production.—Coutts and Co. and F. Johnson (Legal representatives of J. Y. Johnson (deceased)). (I. G. Farbenindustrie). Nov. 10, 1934. 446,433.

INSULATING MATERIALS, manufacture and production.—Coutts and Co. and F. Johnson (Legal representatives of J. Y. Johnson (deceased)). (I. G. Farbenindustrie). Nov. 22, 1934. 446,442.

TREATING WASTE RUBBER for the recovery of other products, methods.—L. Biseo. Dec. 18, 1933. 446,448.

PURIFICATION OF ALCOHOLS.—Coutts and Co. and F. Johnson (Legal representatives of J. Y. Johnson (deceased)). (I. G. Farbenindustrie). Dec. 17, 1934. 446,305.

### Applications for Patents

MINERAL OILS, production.—C. Creanga. (Rumania, April 25, '35.) 11988.  
APPARATUS FOR EFFECTING REACTIONS between gases and liquids. E. I. du Pont de Nemours and Co. 11993.  
N-SUBSTITUTED CAMPHORIC AMIDES, preparation.—G. B. Ellis (Soc. des Usines Chimiques Rhone-Poulenc). 11963.  
BROMONAPHTHAIC ACID, manufacture.—D. A. W. Fairweather. 11831.  
SYNTHETIC DRYING OILS.—W. W. Groves (I. G. Farbenindustrie). 11724.  
VALUABLE OILS, manufacture.—W. W. Groves (I. G. Farbenindustrie). 11725.  
PREPARATIONS CONTAINING CALCIUM COMPOUNDS, manufacture.—L. Hamburger. 12082.  
REMELTING, ETC., MAGNESIUM, method.—I. G. Farbenindustrie. (Germany, July 19, '35.) 11653.  
COATING MATERIALS WITH RUBBER.—Imperial Chemical Industries, Ltd. 11770, 11771.  
BROMONAPHTHOIC ACID, manufacture.—Imperial Chemical Industries, Ltd. 11831.  
SHAPED ARTICLES, manufacture.—Imperial Chemical Industries, Ltd. 11992.  
APPARATUS FOR ROLLING HOT METAL.—Imperial Chemical Industries, Ltd. 12204.  
POLYMERISED OLEFINS.—Imperial Chemical Industries, Ltd. 12205.  
SULPHURIC ACID ESTERS, processes for obtaining.—H. W. K. Jennings. (Chemische Fabrik Stockhausen and Cie). 11645.  
ALKALI METAL FLUORIDES AND HYDROXIDES, manufacture.—H. W. K. Jennings (Chemische Fabrik Stockhausen and Cie.) 12239.  
POLYHYDROXY CARBOXYLIC ACIDS, production.—G. W. Johnson (I. G. Farbenindustrie). 11613.  
WATER-SOLUBLE AMIDES of polynuclear aromatic hydroxy-carboxylic acids, production.—G. W. Johnson (I. G. Farbenindustrie). 11614.  
PURIFICATION OF GASES containing acids.—G. W. Johnson (I. G. Farbenindustrie). 11928.  
BENZINE, production.—G. W. Johnson (I. G. Farbenindustrie). 11929.  
AZO DYESTUFFS, production.—G. W. Johnson (I. G. Farbenindustrie). 12069.  
FAST DYEINGS ON SILK, production.—G. W. Johnson (I. G. Farbenindustrie). 12070.

### Latest Oil Prices

LONDON, May 13.—LINSEED OIL was barely steady. Spot, £27 (small quantities); May, £24 12s. 6d.; June-Aug., £24 15s.; Sept.-Dec., £25; Jan.-April, £25 2s. 6d. (nominal), naked.  
SOYA BEAN OIL was slow. Oriental (bulk), May shipment, £21 15s., sellers. RAPE OIL was inactive. Crude extracted, £34; technical refined, £35 10s., naked, ex wharf. COTTON OIL was quiet, Egyptian crude, £24 10s.; refined common edible, £27 10s.; deodorised, £29 10s., naked, ex mill (small lots £1 10s. extra). TURPENTINE was steady. American, spot, 39s. 3d. per cwt.  
HULL.—LINSEED OIL, spot, quoted £25 10s. per ton; May and June-Aug., £25; Sept.-Dec., £25 2s. 6d. COTTON OIL, Egyptian, crude, spot, £24 10s.; edible, refined, spot, £27; technical, spot, £27; deodorised, £29, naked. PALM KERNEL OIL, crude, f.m.q., spot, £20, naked. GROUNDNUT OIL, extracted, spot, £30 10s.; deodorised, £33 10s. RAPE OIL, extracted, spot, £33; refined, £34 10s. SOYA OIL, extracted, spot, £26; deodorised, £29 per ton. COD OIL, f.o.r. or f.a.s., 25s. per cwt., in barrels. CASTOR OIL, pharmaceutical, 42s. 6d. per cwt.; firsts, 37s. 6d.; seconds, 35s. 6d. TURPENTINE, American, spot, 42s. 6d. per cwt.

## Chemical and Allied Stocks and Shares

**B**USINESS in the Stock Exchange has been comparatively quiet. Although the lower unemployment figures, the record production of steel last month and other indications of improvement created an excellent impression, this was offset to some extent by the fear of increased competition in export markets if devaluation of the franc and other currencies was decided upon. Shares of chemical and kindred companies were again relatively steady. B. Laporte were under the influence of the larger dividend of 22½ per cent., against 20 per cent. This had not been generally expected in the market where it was believed the directors would probably make no change in the dividend in view of their usual conservative policy and the fact that the capital was increased by the share bonus earlier in the year. No doubt the full results will show the increased dividend is covered by a large margin of profits. Imperial Chemical were steady. United Molasses did not respond to the interim dividend which had been generally anticipated. The fact that the directors have decided to resume payment of an interim dividend suggests the company is making further good progress towards regaining the high level of profits ruling in the past. The market believes the directors may issue a progress report shortly. British Cyanides is another company which may resume interim dividend payments this year. The shares have held up quite well on balance for the week. Boots Pure Drug reacted despite the excellent increase in profits for the past year. The dividend and cash bonus are unchanged. Borax Consolidated deferred were firm on confirmation that the company is making further progress. The directors have decided to issue 150,000 deferred shares to shareholders at 27s. per share and it is stated that there has been increased demand for the company's crude and refined products; that additions to plant have enabled a substantial increase in profits to be earned; and that for the current year sales are in excess of those for the corresponding

period of the previous year. International Combustion ordinary shares were again bought at higher prices, while Low Temperature Carbonisation shares were also active, having remained under the influence of the recent announcement regarding the new plant. Goodlass Wall and Lead Industries were steadier on further consideration of the past year's results which indicate that profits have been arrived at on a very conservative basis. Paint shares held up fairly well, including Lewis Berger and Pinchin Johnson. Both these companies have achieved excellent results in recent years. Their outlook is viewed favourably in the market, partly because of the larger demand for paint expected at home, and partly as both have well established subsidiaries overseas with production facilities, the adverse effects of foreign tariffs are obviated to some extent. Associated Portland Cement were fairly steady and Alpha Cement active, the last named on the news that the company is to acquire another business. Crosfields Oil and Cake were very firm on the maintenance of the dividend and British Oil and Cake Mills little changed. Unilever have maintained the improvement which followed the meeting and Lever Brothers preference continued to hold up well. United Water Softeners have been higher at Birmingham with business recorded up to 29s. 6d. Valor shares have gone back further on balance for the week, the statements at the recent statutory meeting having tended to indicate that even if market expectations of a large increase in profits were realised the directors would probably decide on a conservative dividend policy for the time being. Distillers were active at higher prices, the results of subsidiary companies having increased hopes in the market of a larger dividend. Triplex Safety Glass were steady. Chloride Electrical Storage "A" and "B" ordinary shares have moved up to around 97s. 6d. on the possibility of an increased dividend or a share bonus.

Name.	May 13.	May 6.
Anglo-Iranian Oil Co., Ltd. Ord.	94/4½	92/6
Associated Dyers and Cleaners, Ltd. Ord.	1/3	1/10½
Associated Portland Cement Manufacturers, Ltd. Ord.	86/10½	86/3
" 5½% Cum. Pref.	28/9	28/9
Benzol & By-Products, Ltd. 6% Cum. Part Pref.	6/3	6/3
Berger (Lewis) & Sons, Ltd. Ord.	68/1½	69/4½
Bleachers' Association, Ltd. Ord.	5/7½	5/7½
Boake, A., Roberts & Co., Ltd. 5% Pref. (Cum.)	20/-	20/-
Boots Pure Drug Co., Ltd. Ord. (5/-)	54/6	56/3
Borax Consolidated, Ltd. Pfd. Ord. (£)	112/6	112/6
" Defd. Ord.	28/9	30/-
" 5½% Cum. Pref. (£10)	£11/15/-	£11/15/-
Bradford Dyers' Association, Ltd. Ord.	8/1½	8/1½
British Celanese, Ltd. 7% 1st Cum. Pfd.	23/3	23/9
British Cotton & Wool Dyers' Association Ltd. Ord. (5/-)	5/9	5/9
British Cyanides Co., Ltd. Ord. (2/-)	3/9	4/-
British Drug Houses, Ltd. Ord.	20/-	20/-
" 5% Cum. Pref.	22/6	22/6
British Glues and Chemicals, Ltd. Ord. (4/-)	10/3	10/3
" 8% Pref. (Cum. and Part.)	30/-	30/-
British Oil and Cake Mills, Ltd. Cum. Pfd. Ord.	49/-	49/-
British Oxygen Co., Ltd. Ord.	91/3	90/-
" 6½% Cum. Pref.	33/9	28/9
British Portland Cement Manufacturers, Ltd. Ord.	93/9	93/9
Bryant & May, Ltd. Pref.	66/3	67/6
Burt, Boulton & Haywood, Ltd. Ord.	21/3	21/3
" 7% Cum. Pref.	28/9	28/9
" 6% 1st Mort. Deb. Red. (£100)	£102/10/-	£102/10/-
Bush, W. J., & Co., Ltd. 5% Cum. Pref. (£5)	108/9	108/9
" 4% 1st Mort. Deb. Red. (£100)	£94/10/-	£94/10/-
Calico Printers' Association, Ltd. Ord.	7/6	7/6
Cellulose Acetate Silk Co., Ltd. Ord.	10/11½	11/6
Consett Iron Co., Ltd. Ord.	10/9	11/6
Cooper, McDougall & Robertson, Ltd. Ord.	35/-	35/-
" 7% Cum. Pref.	28/9	28/9
Courtaulds, Ltd. Ord.	48/9	48/1½
Crosfield, Joseph, & Sons, Ltd. 5% Cum. Pre-Pref.	25/-	25/-
Distillers Co., Ltd. Ord.	102/-	100/-
" 6% Pref. Stock Cum.	31/6	31/6
Dorman Long & Co., Ltd. Ord.	32/6	31/3
English Velvet & Cord Dyers' Association Ltd. Ord.	3/9	3/9
Fison, Packard & Prentice, Ltd. Ord.	44/4½	44/4½
" 7% Non-Cum. Pref.	31/3	31/10½
" 4½% Debs. (Reg.) Red. (£100)	£106	£106

Name.	May 13.	May 6.
Gas Light and Coke Co. ....	28/3	28/3
" 4% Consolidated Pref. Stock (£100)	£106/10/-	£106/10/-
Goodlass Wall & Lead Industries, Ltd. Ord. (10/-)	14/4½	14/4½
" 7% Prefd. Ord. (10/-)	13/1½	13/1½
" 7% Cum. Pref.	28/9	28/9
Gossage, William, & Sons, Ltd. 6½% Cum. Pref.	24/4½	24/4½
Imperial Chemical Industries, Ltd. Ord.	39/3	39/3
" Deferred (10/-)	9/7½	9/7½
" 7% Cum. Pref.	34/9	34/3
Imperial Smelting Corporation, Ltd. Ord.	17/6	17/-
International Nickel Co. of Canada, Ltd. Cum.	\$45	\$46
Johnson, Matthey & Co., Ltd. 5% Cum. Pref. (£5)	105/-	105/-
Laporte, B., Ltd. Ord.	117/6	120/-
Lawes Chemical Co., Ltd. Ord. (10/-)	8/9	8/9
" 7% Non-Cum. Part Pref. (10/-)	10/-	10/-
Lever Bros., Ltd. 7% Cum. Pref.	33/9	33/6
Magadi Soda Co., Ltd. 12½% Pref. Ord. (5/-)	1/3	1/3
" 6% 2nd Pref. (5/-)	6d.	6d.
" 6% 1st Debs. (Reg.)	£35	£35
Major & Co., Ltd. Ord. (5/-)	7½d.	7½d.
" 8% Part. Prefd. Ord. (10/-)	9d.	9d.
" 7½% Cum. Pref.	1/6½	1/6½
Pinchin, Johnson & Co., Ltd. Ord. (10/-)	45/6	44/6
Potash Syndicate of Germany 7% Gld. Ln. Sr. "A" and "B" Rd.	£78	£77
Reckitt & Sons, Ltd. Ord.	115/-	115/-
Salt Union, Ltd. Ord.	45/-	45/-
" Pref.	47/6	47/6
South Metropolitan Gas Co. Ord. (£100)	£125/10/-	£125/10/-
Staveley Coal and Iron Co., Ltd. Ord.	53/9	54/4½
Stevenson & Howell, Ltd. 6½% Cum. Pref.	26/3	26/3
Triplex Safety Glass Co., Ltd. Ord. (10/-)	91/10½	92/6
Unilever, Ltd. Ord.	31/3	31/3
United Glass Bottle Manufacturers, Ltd. Ord.	46/3	46/3
United Molasses Co., Ltd. Ord. (6/8)	24/4½	23/9
United Premier Oil & Cake Co., Ltd. Ord. (5/-)	10/7½	11/3

## New Companies Registered

**Hydrosol Products, Ltd.**—Registered May 9. Nominal capital, £350. To acquire the business now carried on by E. L. O. Bower as "Lubrico Oils" and to carry on the business of consulting, chemical, civil and mechanical engineers, chemists and druggists. A director: Clifford O. Bower, Eastcote Cottage, Eastcote, Middlesex.

## Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

### Mortgages and Charges

(NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt as specified in the last available Annual Summary, is also given marked with an \*—followed by the date of the Summary, but such total may have been reduced.)

DORMAN, LONG AND CO., LTD., Middlesbrough, steel manufacturers, etc. (M., 16/5/36.) Registered May 4, mortgage supplemental to Trust Deeds dated July 26, 1923, and December 31, 1924; charged on mines of limestone and ganister at Stanhope (Durham), etc. (subject to prior lien debenture stock). \*£4,711,816. December 24, 1935.

### County Court Judgments

(NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court Judgments against him.)

ANTHONY DOUGLAS AND CO., LTD., 66 Southampton Road, N.W., manufacturing chemists. (C.C., 16/5/36.) £42 10s. 7d. April 7.

### Companies Winding-up Voluntarily

ELECTRO-METALLURGICAL RESEARCH CO., LTD. (C.W.U.V., 16/5/36.) By special resolution, April 29, for purpose of amalgamation, with Aluminium Protection Co., Ltd. Douglas Charles Thomson, 150 Southampton Row, London, W.C.1, appointed liquidator. Creditors' debts or claims, by May 25, to the liquidator.

THE ASSOCIATION FOR THE PROMOTION OF CO-OPERATION BETWEEN SCIENTIFIC AND TECHNICAL SOCIETIES AND INSTITUTIONS WITHIN THE BRITISH EMPIRE. (C.W.U.V., 16/5/36.) By special resolutions May 5, Mr. W. B. Keen, of W. B. Keen and Co., appointed liquidator. Resolution II provides that the ultimate assets of the Association remaining over after all expenses connected with winding-up the Association have been met, shall be divided as to two-thirds to the Chemical Council and one-third in equal portions to the Institution of Mining and Metallurgy, the Institute of Mining Engineers, the Institution of Petroleum Technologists, the Iron and Steel Institute, the Institute of Metals, the Institute of Fuel.

## Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

**Czechoslovakia.**—An agent established at Prague wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of edible and technical vegetable oils, fish oils, raw and semi-manufactured chemical products. (Ref. No. 377.)

**Poland.**—A commission agent in Warsaw desires to obtain the representation of United Kingdom manufacturers of drugs, chemicals, patent medicines, toilet preparations, etc. (Ref. No. 380.)

**Sweden.**—An agent established at Gothenburg wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of chemicals, raw materials for paint and varnish manufacture; industrial machinery. (Ref. No. 382.)

**Egypt.**—H.M. Consul-General at Alexandria reports that the Municipality of Alexandria is calling for tenders, to be presented in Alexandria by June 15, 1936, for the supply of disinfectants, i.e., commercial phenic acid (or a similar disinfectant), commercial sulphuric acid, and muriatic (hydrochloric) acid. (Ref. TY, 40069.)

**Dominican Republic.**—An agent established at Santiago de los Caballeros, Dominican Republic, wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of coconut oil, tallow and soya bean oil. (Ref. No. 389.)

**Australia.**—A firm of merchants, importers and agents established at Sydney wishes to obtain the representation of United Kingdom manufacturers of dry colours for printing ink manufacture. (Ref. No. 364.)

**Australia.**—H.M. Trade Commissioner at Melbourne reports that the Melbourne City Council is calling for tenders, to be presented in Melbourne by June 15, 1936, for the supply of boiler plant, comprising water tube boiler, superheater, pulveriser burners, etc. (Ref. T.Y. 30157.)

**British East Africa (Kenya and Uganda).**—The Crown Agents for the Colonies, 4 Millbank, London, S.W.1, report that the Kenya and Uganda Railways and Harbours are inviting tenders for the supply of petrol and kerosene for a period of twelve months from July 1, 1936, to June 30, 1937. The appropriate monthly requirements are: petrol, 6,500 gal.; kerosene, lighting, 3,400 gal., and kerosene, power, 400 gal. Further particulars and specifications and conditions of contract can be obtained on application to the Crown Agents.

## Forthcoming Events

### LONDON

**May 20.**—The British Chemical and Dyestuffs Traders' Association, Ltd. Luncheon 1 p.m. Annual general meeting. 2.30 p.m. Waldorf Hotel, London.

**May 22.**—Royal Institution. "Whirlpools and Vortices." Professor E. N. da C. Andrade. 9 p.m. 21, Albemarle Street, W.1.

### BIRMINGHAM

**May 20.**—Society of Glass Technology. "Glassware Finishing Machinery with Special Reference to Tableware." E. Venis: "Schools of Glass Decorative Art in Czechoslovakia and Germany." Professor W. E. S. Turner. 7.30 p.m. Grand Hotel, Birmingham.

## Books Received

**Elementary Quantitative Analysis.** By Hobart H. Willard and N. Howell Furman. London: Macmillan and Co., Ltd. Pp. 436. 14s.

**Salts and their Reactions.** By Leonard Dobbin and John E. Mackenzie. Edinburgh: E. and S. Livingstone. Pp. 246. 6s.

**Experimental Researches and Reports.** Published by Department of Glass Technology, Sheffield. Pp. 327. 7s. 6d.

**Distillation.** By Joseph Reilly. London: Methuen and Co., Ltd. Pp. 120. 3s. 6d.

### Official Publications

**A Review of the Physiology and Biochemistry of the Sulphur Bacteria.** By H. J. Bunker. London: H. M. Stationery Office. Pp. 48. 9d.

**Survey of the Biochemical Activities of the Acetic Acid Bacteria.** By K. R. Butlin. London: H.M. Stationery Office. Pp. 48. 1s.

## Company News

**British Alkaloids.**—Payment is announced in respect of the year ended March 31, 1936, of 15.08 per cent., less tax, on 8 per cent, participating preference shares, and 22 per cent., less tax, on ordinary shares.

**United Molasses Co., Ltd.**—The directors announce the resumption of interims on the ordinary stock. For the current year the payment is to be 4 per cent. actual, less tax, payable on June 15. This interim is the first to be paid since 1929, in which year the total cash distribution was 25 per cent., made up of an interim of 10 per cent., a final of 12½ per cent. and a bonus of 2½ per cent. In addition, there was a capital bonus of 50 per cent. in ordinary shares from reserves.

**Nitrate Railways Co., Ltd.**—The directors announce that operations for 1935 resulted in a net profit of £16,853, which, however, was more than absorbed by exchange losses. Due to this and because, despite the board's continued efforts, no arrangement has yet been made with the Chilean Government in regard to the Iquique-La Noria Concession, which terminates on July 26 next, the directors have decided not to recommend a dividend in respect of the year. By reason of dividends and interest received the carry-forward is increased from £144,487 to £176,459.

**Grosfields Oil and Cake.**—Net profits declined from £12,927 to £11,628 in the year to March 31 last. The dividend, which is maintained at 15 per cent., less tax, absorbs £11,437, leaving the carry-forward up from £1,777 to £1,967.

**International Nickel Co. of Canada, Ltd.**—A net operating profit of \$11,456,397 and a net profit of \$8,386,787, equivalent to 54 cents per share, on the common stock, after allowing for the preferred dividend of \$483,475, is reported for the first three months of 1936. This compares with a net profit of \$4,917,627, equivalent to 50 cents per share, for the corresponding quarter in 1935, and with \$8,005,700, or 51 cents per share, for the final quarter of 1935.

**National Drug and Chemical Co. of Canada.**—In a circular to the preference shareholders, the trustees in England, Mr. Charles Gane and Viscount Elibank, say that the business of the company considerably improved last year, and that instead of a small loss there is a net profit of £18,592, which, with £12,822 brought in, makes £31,414 to be carried forward. Under the recent reconstruction scheme the preference dividends are not being resumed until February, 1937, but the trustees say that if the business continues to improve they hope it will be possible to pay some dividend on the preference shares next year. The annual meeting has been called for May 28, but it is proposed to adjourn this meeting to July 9 to enable the new trust deed and other matters to be settled.

**Veno Drug.**—Deferred shareholders are to receive a dividend of 196 per cent., less tax, for the year to March 31 last. This is 122 per cent. more than a year ago, when the dividend was raised from 73 per cent. to 74 per cent.

**Boots Pure Drug Co.**—The directors announce in a preliminary profit statement that, subject to audit, net profits for the year ended March 31 last amounted to £770,889. This compares with £750,037 for the preceding year—a rise of over £20,800. In addition to the four interim dividends already paid, amounting to 24 per cent., less tax, a bonus of 3d. a share (or 5 per cent.), tax free, will be paid to shareholders registered on May 8. This is the same distribution as paid for the past seven years.

**North British Rubber Co., Ltd.**—A trading profit of £20,652 is reported for 1935, less than half the amount earned in 1934. With a profit of £4,500 from the sale of investments and £8,222 brought forward, the accounts show a credit balance of £33,374. Depreciation absorbed £10,000, against £19,860, debenture interest £18,511, and directors' fees £1,939. In addition, £2,407 was allowed for depreciation on an investment in a Belgian subsidiary due to the fall in currency. In the previous year £18,000 was written off an investment in a subsidiary operating in Brazzaville. After these charges a credit of £517 remains to go forward. The dividend on preference shares is in arrears since June, 1930.

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